NOVEMBER 23, 1944

American Machinist

ECHNOLOGY DEP

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DETROIT

Sub-Zero Treatment Improves Tool Life

•

Chip and Oil Salvage

•

Careful Sharpening of Thread Milling Cutters

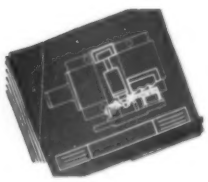
•

Accurate Blanks Produce Fine-Pitch Spur Gears

Single Point Tools

The A B C's of Versatility

WITH HEALD BORE-MATICS

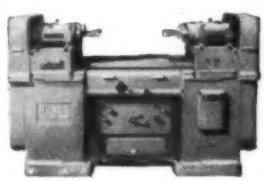


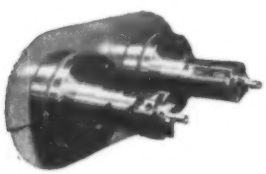
THE OPERATION — All types to suit your requirements

Bore-Matics are all-purpose tools, readily adaptable for boring, turning, facing, chamfering or grooving. Straight or taper surfaces can be machined, also curved and irregular shapes. These operations can be performed singly, simultaneously, progressively or in combination, in finishing, semi-finishing or roughing cuts.

THE MACHINE — Basically adaptable to all jobs

Basic design of Bore-Matics has unusual versatility permitting individual arrangement to suit every job—like slotted bridges holding one or more boring heads—flexible, adaptable drive to heads by V-belts—single-end or double-end bases—variable hydraulic feeds—hydraulic power for auxiliary attachments and clamping—and manual or automatic cycles.





THE TOOLING — Get maximum cutting efficiency

Possibilities of tooling arrangements on Bore-Matics are almost limitless. Single-point, broad-nose and form tools can be employed, either rotated by quills, fed radially by rotating tool slides, or given contour movement for irregular surfaces. Tools also can be mounted on the table, on cross-slides or angular slides, and on rotary tool blocks. Arrangements are also available for tool indexing and retraction.

THE FIXTURES — Get faster, better chucking

Widely diversified methods of work holding are available on Bore-Matics. Work can be chucked in rotating fixtures, between centers, or in stationary fixtures. Rotary-indexing fixtures, horizontal or vertical types, can also be furnished. When required, fixtures can be mounted on cross-slides for indexing or retraction from tools. Hydraulic, pneumatic or manual clamping is available.

HEALD Bore-Matics

THE MOST VERSATILE MACHINE TOOL

THE HEALD MACHINE COMPANY · WORCESTER 6, MASS.

American Machinist

November 23, 1944

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PRINTED IN U. S. A

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From _____

_____

To _____

_____

Signed _____

American Machinist Chips

Metal Show Memoirs . . . It took us a little while to recover from the maelstrom which was Cleveland from October 16 to 20, but now we can announce, at least tentatively, plans for our participation next year.

We think we shall build a trailer—in which we shall journey to the Show and thus avoid the agony of trying to get suitable train reservations. The trailer will be wheeled into the exhibit hall, and when unfolded will make a first rate booth. No struggle to get furniture or decorations.

The contraption will easily be re-assembled each evening and will serve as living quarters—thus avoiding the fruitless search for hotel rooms.

The trailer will be complete with cigarettes, cornplasters, bedroom slippers and other aids to living most of the day among 414 other exhibitors. No kidding, it was quite a show this year and seldom have we seen such variety of things going on. Amazing, too, was the eager taking of literature at our own *AM* booth. Not so much the usual grabbing by the kids, but an exceptional amount of sincere, know-how seeking by practical men.

This seemed to bring home to us the intense desire for Metal-Working production facts which exists today, and we are glad to contribute our share.

War Plant Reconversion . . . Mason Britton—distinguished *American Machinist* alumnus and now (among other things) Chairman of the War Plants Utilization Committee—recently addressed the 16th Annual Boston Conference on Distribution. He said that of $16,000,000,000 worth of government owned war plants, perhaps $9,000,000,000 can be converted to peacetime work. Plans are under way to effect the disposition of more than 700 U. S. plants "on the local community level."

Deflation vs Inflation . . . In the same Conference as mentioned above, several speakers gave the opinion that current economic optimism is a great danger to our future employment situation, and we may well have deflation—not inflation—in the postwar period.

Prominent among the reasons given was that while our productive capacity and efficiency have increased enormously, normal consumption has not and cannot increase at such a pace.

Favorable Winds . . . A sincere salute to Wright Aeronautical Corp. for the 25th Anniversary Number of their publication *Trade Winds*. In treatment of illustrations and text, the 40-page booklet did a grand job of not only showing Wright's progress, but throwing many interesting highlights on developments in aircraft engine manufacture.

Centering the booklet was a series of original paintings by Frank Lemon, documenting the uses of airpower in this war. *(Our sons, Nine and Eleven, have already spoken for these as special wall decorations.)*

Among the interesting contents of the booklet were "Fabulous Facts about the Cyclone":

On a flight from New York to Washington, the spark plugs in a single Cyclone cylinder flash more than 81,000 times.

A Cyclone 18's oil pumping system is capable of circulating at the rate of more than 43 gallons a minute (both for engine and by-pass).

Equal in power to a fair-sized freight locomotive, 2,000 horsepower Cyclone weighs no more than the locomotive's wheels alone, takes up less space than there is in the cab.

In less than 3 hours, a Cyclone 18 requires for combustion more air than could be contained in a K-type blimp . . . which measures a block long and more than four stories high.

Built into the compact cylinders of a Cyclone 14 is a cooling area of some 580 square feet—or more than the area of a pair of bowling alleys.

For these nuggets of interest, as well as for page after page of historical and other facts, congratulations to Wright for a swell job.

THE SATURDAY EVENING POST

"Mrs. Van Wyck wishes to be reconverted to postwar activity."

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BEVEL GEAR DRIVES — TO *Victory*

Gleason-cut spiral bevel gear drives
. . . for earth moving equipment

CLEARING THE WAY TO VICTORY

In the face of shell-fire and dive bombing, American earth-moving machines and the intrepid men who operate them are truly setting the pace of the Allied advance toward victory. Whether on Kwajalein or at Cassino, these husky units quickly build airfields and roads so that our mechanized equipment can function.

The efficiency of these machines . . . their ability to move heavy loads over rough terrain and steep grades with the power of a tractor and the speed of a truck, is a tribute to American engineering and production skill.

DURABLE POWER TRANSMISSION PROVIDED BY SPIRAL BEVEL GEARS

Spiral bevel gears furnish the means of transmitting smoothly the driving power for these machines as it makes a right-angle turn from the motor and transmission into the wheel units. These gears have met the test — standing up under the heavy and shock loading which is characteristic of the rigorous conditions under which these machines operate.

CUT ON GLEASON MACHINES

Both pinions and gears are produced with great accuracy and in amazing quantities on the No. 26 Machines, aided by essential Gleason auxiliary equipment.

This is just one of many illustrations of the part spiral bevel gears play in providing high standards of performance for power driven machinery. This war-proven capability of spiral bevel points the way to new types of power transmission for the machines of tomorrow.

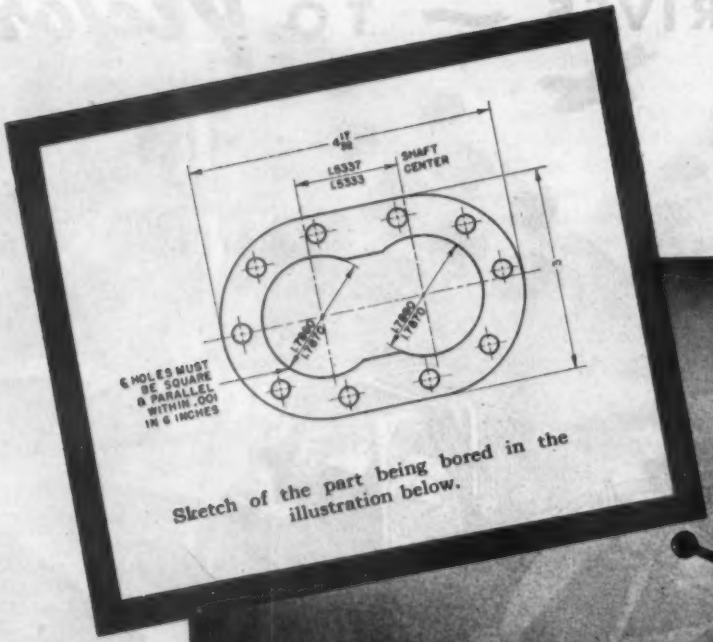
GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

High



Sketch of the part being bored in the illustration below.

Keep on buying
WAR BONDS

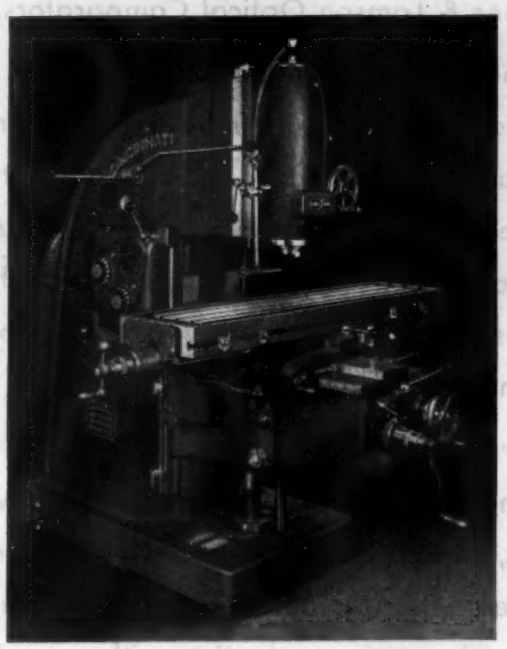
THE CINCINNATI

MILLING MACHINES

Production Attachment Goes to Bat for Precision!

CINCINNATI

In the illustration on the opposite page, a CINCINNATI Vertical Dial Type Milling Machine, equipped with Power Feed to the Head, is rough and finish boring two $1\frac{25}{32}$" holes in a pump part, using a standard Index Base to obtain the desired precision. The work holding fixture is located so that the two holes to be bored are concentric with the center of the Index Base swivel. When the first hole is bored, the operator simply swivels and clamps the Index Base and bores the second hole. On this job accuracy was of paramount importance because the bore had to be square and parallel within .001" in 6". ¶ The above setup is rather unusual, but it emphasizes the versatility of the Dial Types. Perhaps it suggests ways in which the Dial Types and standard milling attachments could solve many of your machining problems.



CINCINNATI *No. 3 Vertical Dial Type Milling Machine. Dial Types are available in Plain, Universal and Vertical styles, Nos. 2, 3 and 4 sizes, Medium and High Speed Ranges. Catalog M-970-2 contains complete information and specifications. Sweet's Catalog File for Mechanical Industries contains a brief description of these machines.*

Left: Rough and finish boring two holes in a pump part. Equipment includes 12" x 24" Index Base and Power Feed to the Head. The machine is a CINCINNATI No. 2 Vertical Dial Type Miller.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

This, in brief, is what a manufacturer of precision tools and gauges has to say about *his* Jones & Lamson Optical Comparator. The record speaks for itself, but it is just one of hundreds of instances where the use of these Comparators has resulted in inspection economies, better products and satisfied customers.

Form tools, gauges and other products with complex or multiform contours can be checked and measured in all dimensions with the standard measuring attachments of Jones & Lamson Optical Comparators.

Or, the inspection of large quantities of duplicate parts can be made rapidly and accurately, by comparison with a master outline drawn upon the glass screen, on Comparators designed specifically for this purpose. There is a model for every job, and the results are *beyond a shadow of a doubt.*

For the method best suited to your own needs, consult a Jones & Lamson inspection engineer. There is one near you, and he is backed by an organization with over 20 years experience in the optical inspection field.

"INSPECTS 200% FASTER THAN FORMER METHODS"

"NO CUSTOMER REJECTIONS SINCE INSTALLED"

"CHECKS ACCURATELY IN ALL POSITIONS"

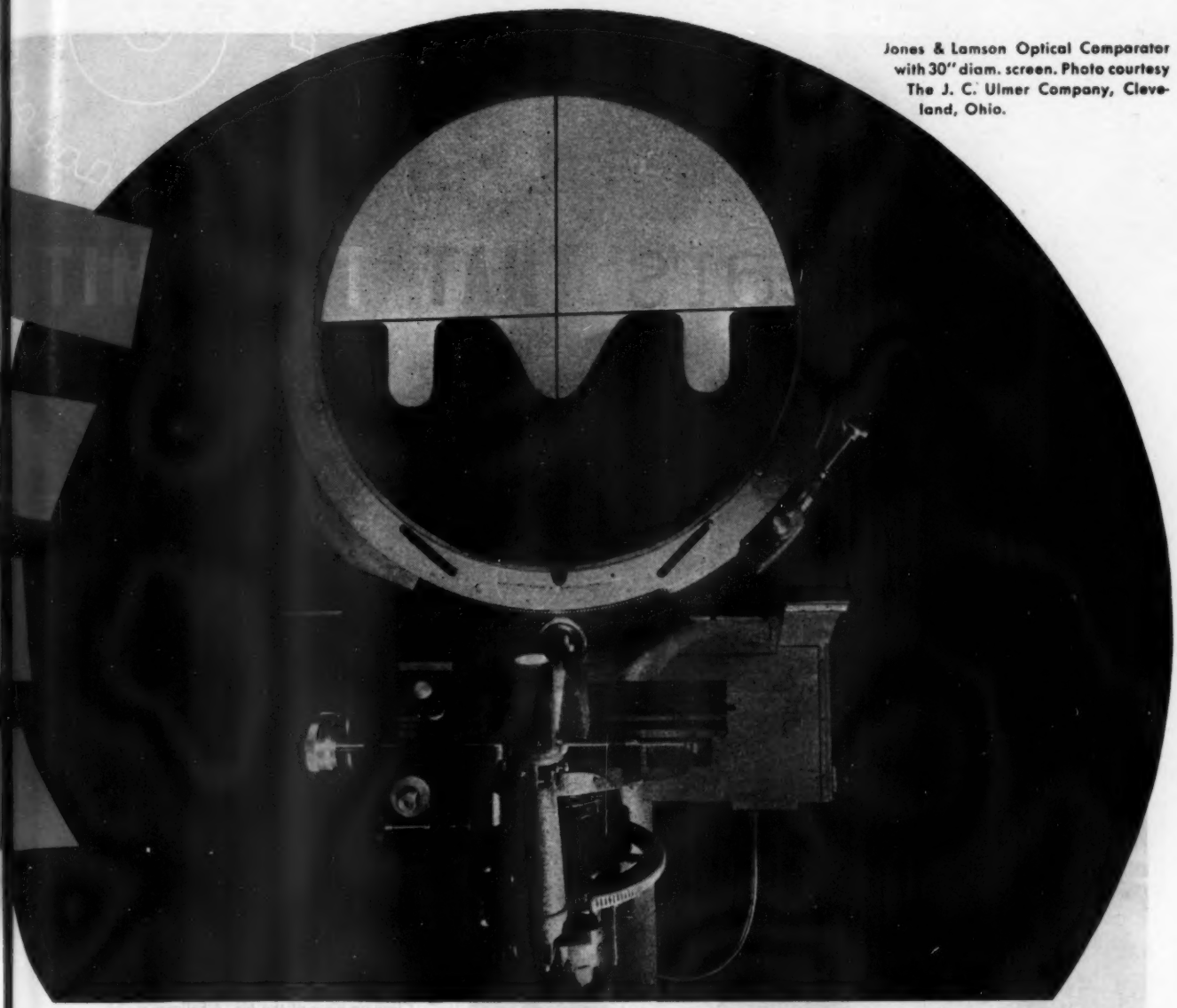
"CHECKS .0002" TOLERANCES ON CONTOUR GAGES"

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.
2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*
3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.
4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.
5. Rigid Machine Construction.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

DID YOU KNOW...
THAT JONES & LAMSON OPTICAL COMPARATORS ARE USED TO INSPECT PRECISION-MADE COMPONENTS OF THE DRY SHAVERS THAT REMOVE YOUR WHISKERS SO SMOOTHLY AND RAPIDLY.



Jones & Lamson Optical Comparator with 30" diam. screen. Photo courtesy The J. C. Ulmer Company, Cleveland, Ohio.

JONES & LAMSON

MACHINE COMPANY

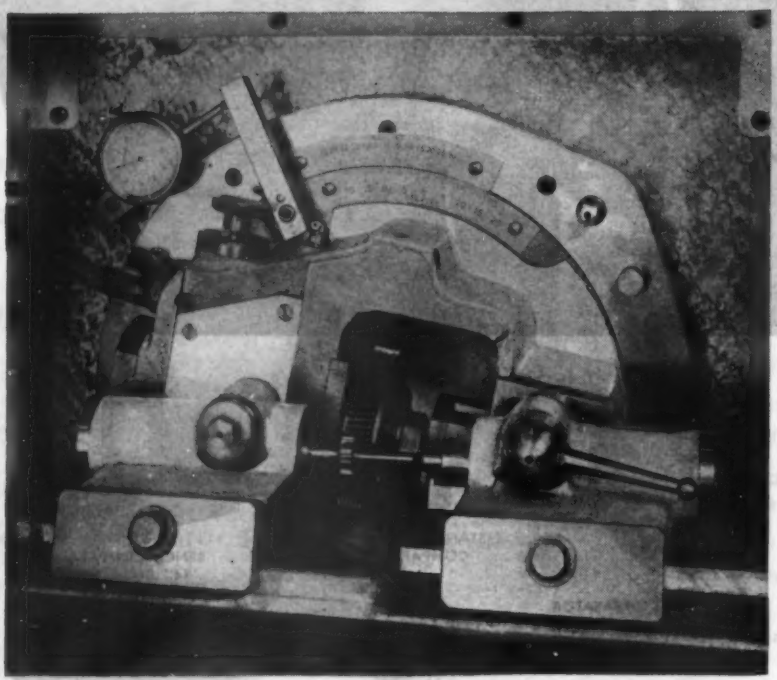
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS
STANDARD BENCH COMPARATOR
BENCH COMPARATOR 14" DIAM. SCREEN
DIRECT PROJECTION COMPARATOR
STANDARD PEDESTAL COMPARATOR
PEDESTAL COMPARATOR 22" — 30" DIAM. SCREENS

Gears THAT TRANSMIT



- Close-up view of the No. 4 Fellows Fine-Pitch Gear Shaving Machine showing adjustable head- and tail-stocks.
- Head carrying the shaving tool is adjustable for crossed-axes setting, with maximum angular movement of 20°, both sides of center.
- Tool-spindle speeds obtainable with 4-step cone pulley drive: 87 R.P.M. to 410 R.P.M. (with motor speed of 1200 R.P.M.)
- Complete electrical control for quick and easy operation.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

A TINY POWER IMPULSE

Smoothly . . .

The United Nations would not be winning this global war if fine-pitch gears were still being produced by former methods. New developments in equipment and manufacturing technique have made possible the making of these gears by the millions, and to degrees of precision that is almost unbelievable.

The successful operation of many instruments such as bombsights, electronic devices, aerial cameras, depends upon the accurate and unerring functioning of fine-pitch gears. In many cases, these gears must operate without backlash. This requires extreme precision in tooth spacing, tooth shape and smoothness of tooth surfaces.

Many manufacturers of fine-pitch gears have found that the No. 4 Fellows Fine-Pitch Gear Shaving Machine fulfills their most exacting requirements. This machine is provided with complete electrical control, and is so designed that it will produce extremely accurate work under present operating conditions.

If you are considering the use of fine-pitch gears in your post-war products, you should know more about the advantages of this method of gear finishing. For full particulars, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit 2, Mich.—or 640 West Town Office Bldg., Chicago 12, Ill.

The No. 4 Fellows Fine-Pitch Gear Shaving Machine finishes gears and pinions from 1/8 inch to 4 inches pitch diameter, 20 diametral pitch and finer.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

HIS NEXT SETUP

MAY BE AN INTERNAL JOB

With a CINCINNATI Hydraulic Universal you can handle a wide variety of precision grinding operations—external, internal and face. And changing from one to another takes only a few minutes. For example: When an internal grinding job comes along you simply pull down the Internal Grinding Attachment, fasten one hold down bolt and go ahead. This attachment, clearly visible in the illustration at the right, is driven by an independent motor and is standard equipment on all Hydraulic Universals. When not in operation, it is up out of the way, but always ready for instant use. ¶ You can depend on CINCINNATI Hydraulic Universals with their FILMATIC Spindle Bearings and other refinements to give you faster setup, faster handling, faster grinding, faster sizing, low maintenance, extreme accuracy, fine finishes on a wide range of work. Investigate today!

If you have a grinding problem, talk it over with our engineers. They will be glad to give you the benefit of more than twenty years' experience in both centertype and centerless grinding.

CINCINNATI

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES

Above: Grinding the shank end of a long gun boring drill on a 12″ Hydraulic Universal. (Catalog illustration shown at the left.) These grinders are available in 12″, 14″, 16″ and 18″ swings; and 36″, 48″ and 72″ between-center lengths. Catalog G-486-1 for 12″ or G-474-1 for larger machines will be sent on request. A brief description of these machines is given in Sweet's Catalog File.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

FIRST CHOICE FOR BALL-RACE

VAN NORMAN

OSCILLATION RADIUS GRINDERS

MORE BALL BEARING RACES ARE GROUND ON VAN NORMAN MACHINES THAN ON ANY OTHER GRINDERS

Ever since they were first introduced in 1914, Van Norman Radius Grinders have been the "Standard" for grinding ball races and other spherical surfaces. And today, they still predominate in the ball bearing industry.

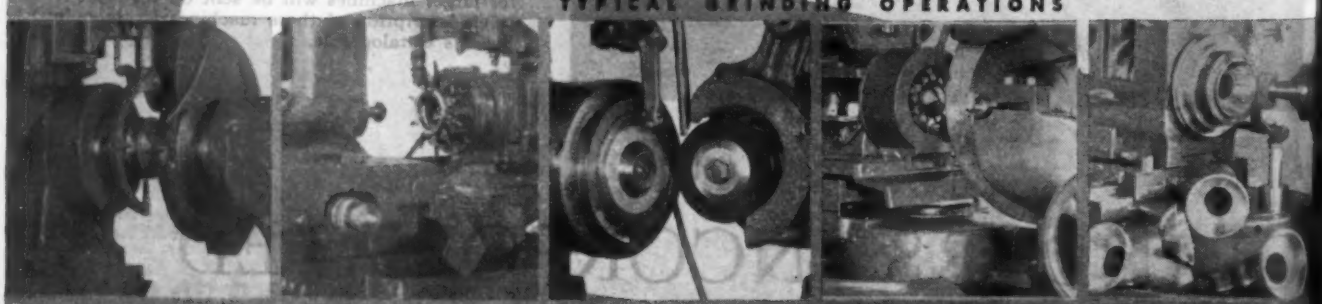
Their popularity is due to their accuracy, efficiency, ease of operation and low maintenance costs . . . all of which result in high production at low cost.

Van Norman features — such as electronic gauging, continuous feeds, wide angle oscillation, diaphragm chucks, wide variety of grinding cycles and automatic operation— assure a steady output to close tolerances whether it be ball races or other spherical parts. Van Norman grinders have a built-in facility for grinding double row races. They are available in a wide range of standard models as well as numerous specials with capacities from 3/8" to 40" diameter. Special attachments are available for grinding magneto-type bearings.

Our engineering department and field engineers are available for consultation and the solution of your grinding problems. Write for their services.

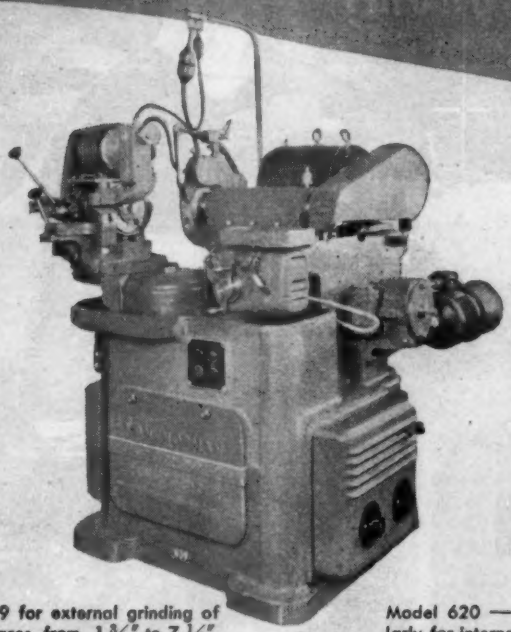
VAN NORMAN COMPANY

TYPICAL GRINDING OPERATIONS

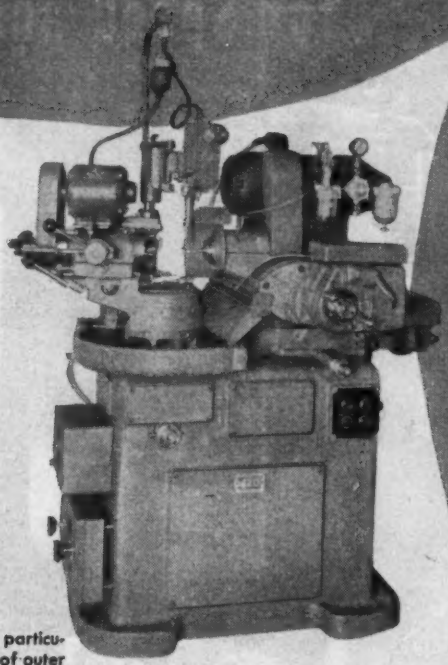


External grinding of inner race | Internal grinding of outer race | Grinding a thrust bearing | Grinding spherical Swivel cap | Grinding spherical bearing surface in automotive part

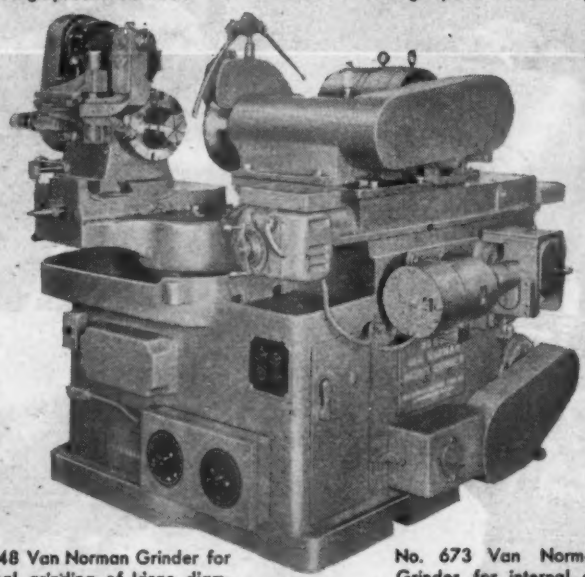
AND SPHERICAL GRINDING...



No. 639 for external grinding of inner races from 1 ¾" to 7 ½". Built for heavy-duty service, this model is capable of performing a wide range of grinding operations at high production rates.



Model 620 — Designed particularly for internal grinding of outer raceways of the smallest sizes and up to 204 size. Supplied with a motorized workhead providing high speed workhead spindle.



No. 648 Van Norman Grinder for external grinding of large diameter inner races from 6" to 16".

No. 673 Van Norman Radius Grinder for internal grinding of outer races from 1 ¾" to 7 ½".

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

THE LANDIS 3/8" THREADING MACHINE

. . . for Speed and Economy

Manufacturers of small parts find the 3/8" LANDIS (High Speed) Threading Machine ideal for handling their work. The high spindle speeds and simplicity of operation, with one lever controlling both the movements of the carriage and the opening of the grips, assure unusual production possibilities. The machine illustrated is producing over a thousand 5/16" diameter studs, 5/8" long, per hour. Several thousand threads are produced per grind of the chasers.

Write for Bulletin No. H-91

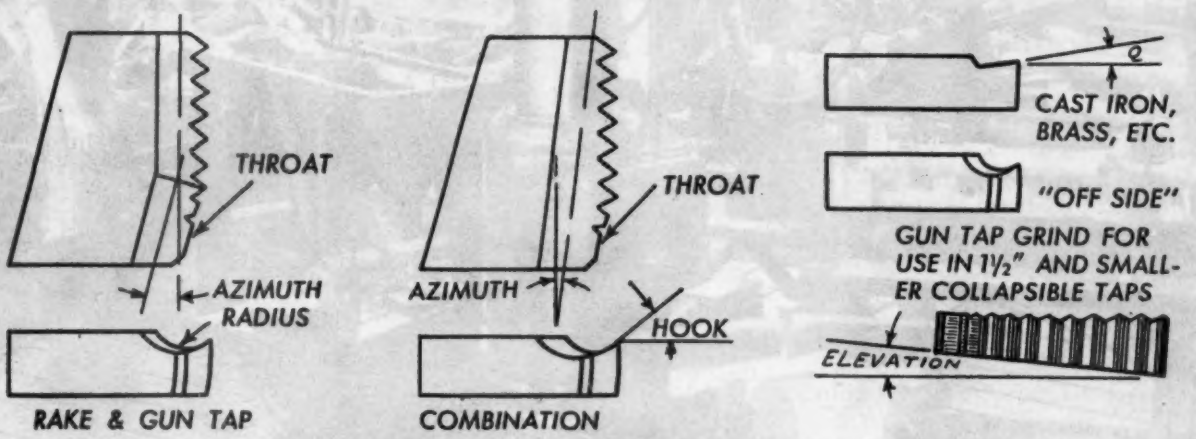
LANDIS MACHINE COMPANY

A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE—MARK PAT. OFF. THREAD TIPS

In the Interest of Efficiency, Better Workmanship and Higher Production

VARIOUS CHASER GRINDS FOR ALL TYPES OF LANDIS TAPS



RECEDING TAPS 1¼" TO 12"

Rake on 1¼" to 12" rec. chasers when throat equals

30° overhand combination—	azimuth	= 3°	elevation	= 2° always used on 1¼" 1½" rec. with overhang
30° plain rake and gun tap—	"	= 22½"	"	= 19°
19° " " " " "	"	= 19°	"	= 17½°
14° " " " " "	"	= 14°	"	= 12°

1¼" – 1½"	Rec.	Plain Chasers.	Gun Tap 3/32"R. – 50°	
1¼" – 1½"	Rec.	Overhang Chasers.	Combination ⅛"R. – 50°	
2"	Rec.	Plain and Overhang.	Gun Tap ⅛"R. – 50°	or Combination
2½"	Rec.	" " "	" " 5/32"R. – 50°	or "
3" – 3½"	Rec.	" " "	" " 3/16"R. – 50°	
3" – 3½"	Rec.	" " "	Combination 7/32"R. – 50°	
4" to 12"	Rec.	" " "	Gun Tap 7/32"R. – 50°	
4" to 12"	Rec.	" " "	Combination ¼"R. – 50°	

1¼" TO 12" COLLAPSIBLE TAP CHASER GRINDS

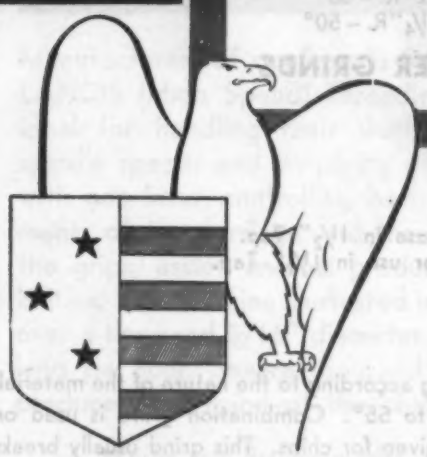
26 to 50 Pitch	Gun Tap	1/16"R. – 50°
18 " 25 "	" "	3/32"R. – 50°
16 " 17 "	" "	⅛"R. – 50°
12 " 15 "	" "	⅛"R. – 50°
10 " 11½ "	" "	5/32"R. – 50°
10 " 13 "	" "	⅛"R. – 50° O.S. for use in 1½" Tap.
14 and finer	" "	3/32"R. – 50° O.S. for use in 1½" Tap.
8 to 9 Pitch	" "	3/16"R. – 50°
6 " 7 "	" "	¼"R. – 50°
4 " 5 "	" "	5/16"R. – 50°

NOTE—Rake and Gun Tap grind is used on soft and mild steels, the hook varying according to the nature of the material. The softer the material, the more hook is necessary. Hooks vary from 20° to 55°. Combination grind is used on materials of tough nature and on pieces where a limited amount of space is given for chips. This grind usually breaks the chips, so they can be washed out with oil. Hooks vary from 20° to 55° according to the material.

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

IDLE MACHINE TIME *ELIMINATED*



As the illustration shows, this "American" Hole Wizard Radial Drill is equipped with a circular base. This base permits multiple work set-ups for successive operations, thus completely eliminating idle machine time resulting from changing from one work set-up to another.

This is one plant's contribution to solving the man power shortage. By keeping its machines in constant operation, it reduces man power requirements to an absolute minimum.

"American" Hole Wizard Radials are meeting the demands of such continuous service.

THE AMERICAN TOOL WORKS CO. CINCINNATI, U.S.A.

Lathes and Radial Drills

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

The soybean is now the third largest cash grain crop in the United States.

get ready with CONE for tomorrow

Aluminum can now be chemically bonded to steel so that the two become a completely integrated unit. This process has already contributed greatly to improvement in the horsepower per pound ratio of certain of our aircraft engines.

get ready with CONE for tomorrow

A 200 page book may now be printed on both sides of a 6 x 9 inch sheet and enlarged for reading by the use of a new machine. This would bring the cost of books to about five cents per volume. It is estimated that a full size encyclopedia, printed by this method, would cost about three dollars.

get ready with CONE for tomorrow

One authority states that oil can be produced from American shale in commercial quantities and at a competitive price.

get ready with CONE for tomorrow

Zein, the new shellac substitute derived from corn, is being used in shoe soles and heels, cements, rain coats, mats, gaskets, and rubber stamps. Packaging films, textile fibers, and bottle caps may be expected later.

get ready with CONE for tomorrow

Most radical of all the new power plants is one in which the fuel is burned in gas mantles and the radiant energy produced is converted into electricity by photo-electric cells.

get ready with CONE for tomorrow

Pure iron can now be deposited on non-metallic substances. By this method a surface of iron may be put on a base of rubber, wood, or plastic.

Some of the new paper-resin laminates may now be formed as easily as a cook lines a plate with pie crust, and require pressures as low as 50 lbs. per square inch.

get ready with CONE for tomorrow

Glass fabric impregnated with synthetic resin is a new material with extraordinary properties. Tensile strength may be more than 80,000 lbs. per square inch.

get ready with CONE for tomorrow

Five states have pooled their electrical generating capacity with results equalling the addition of 135,000 horsepower. This practice is expected to spread.

Aerial photography can show whether the soil of a particular area is gravel, sand, silt, or clay.

get ready with CONE for tomorrow

A new lacquer can be baked on to metal surfaces and removed by heating above 212° F.

get ready with CONE for tomorrow

An experimental Diesel engine weighs only eleven ounces per horsepower and can operate on either Diesel oil or gasoline.

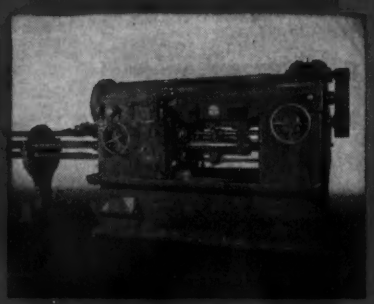
get ready with CONE for tomorrow

A Canadian manufacturer of railroad equipment has designed a flatcar to be used as a landing place for helicopters.

get ready with CONE for tomorrow

The "axonograph" is a device that photographically produces an axonometric drawing directly from a blueprint.

This machine cuts its own weight in metal in four days



3½" 6-Spindle Conomatic

To produce the part shown, 6 pounds of chips — over a sixth of a ton of metal per hour — were removed from WD1314 bar stock.

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

12

A New

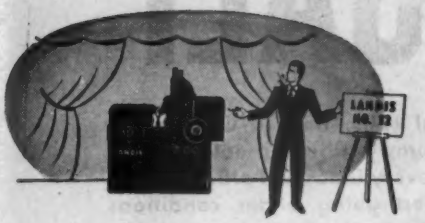
CENTERLESS GRINDER

of Advanced Modern Design

LANDIS TOOL

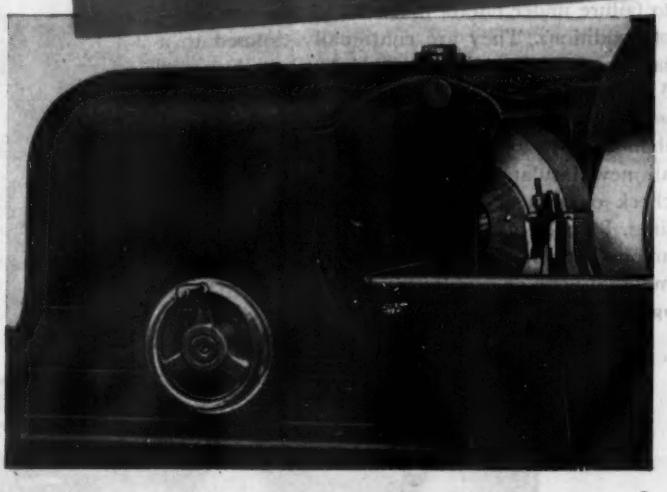
Precision Grinders

LANDIS TOOL COMPANY



Grinding wheel feed and main control grouping Electrical controls include master stop and start buttons, three-way selector switch for set-up, grinding and dressing. Separate adjustments provide regulating wheel speed adjustment and speeds for dressing both wheels.

Regulating wheel base is a complete self-contained unit with an adjustable speed motor driving the wheel. The wheel base can be tilted and swiveled and has a hydraulically operated cross slide.



● The new Landis #12 Centerless Grinder is as modern in features and design as it is in appearance. Outstanding among the many features are the simple centralized controls and the self-contained regulating wheel base.

Both electric and hydraulic controls are located at a convenient height, so grouped that all operations can be controlled quickly and without loss of production time. This contributes materially to the sustained high production possible with the new Landis #12.

The separately driven regulating wheel makes possible new standards of grinding accuracy because of the smooth flow of driving power over the full speed range of the wheel. The best speed for maximum production can be selected without interrupting the grinding cycle.

For complete information on the features of design and specifications of the Landis #12 Centerless Grinding Machine request a copy of Catalog T44. Write The Landis Tool Co., Waynesboro, Pa., on your letterhead giving name and position.

1

LANDIS TOOL Company

WAYNESBORO • PA.

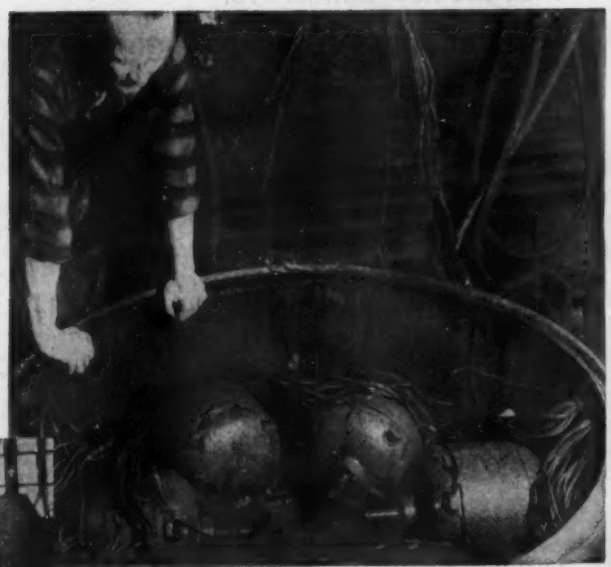
DOSE OF SALT

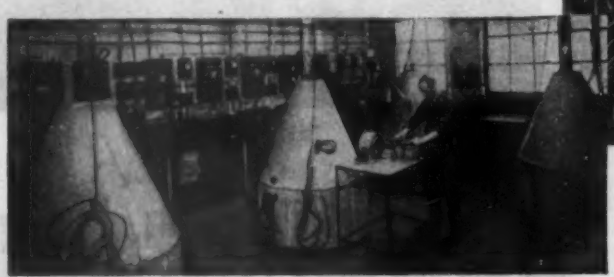
Encrusted with chemical salts, this Tri-Clad motor continues to drive a pump without breakdown of its insulation. In almost every industrial plant, motors are called upon to keep going under conditions which try their endurance to the limit. It may be in a plating room, or on an exhaust fan, or in a wet sub-cellar, or — as in this case — in connection with chemical processing. In emergencies, open motors may face conditions for which good engineering practice would require totally enclosed construction — conditions which tend to corrode the frame and attack the insulation. Endurance of Tri-Clad motors under such conditions results from tests like the one described below.

Salt-spray test of TRI CLAD motors gives assurance of long life in severe service

IN this accelerated life test to determine the ultimate endurance of their insulation, the motors are operated to failure under one of the worst possible combinations of conditions. They are continually exposed to a 2% salt-water spray, while operating on a duty cycle of 3 minutes on and 37 minutes off. (These repeated voltage surges impose greater stress on the insulation than would continuous operation.) Tests are run on all new insulations developed, and as a production check on motors taken at random off the assembly lines. Because of their endurance under this severe test, among others, Formex* wire and Glyptal* bonding material were chosen for Tri-Clad insulation.

*Reg. U. S. Pat. Off.





Left: Conical hoods cover the tanks in which these salt-spray tests are conducted.

GENERAL ELECTRIC

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

"This business of buying Electrodes used to be pretty tough..."
1. WHEN MY STOCK OF ELECTRODES RAN LOW..
2. I'D STOP IN AT MY DEALER FOR A FRESH SUPPLY.
AWS-E-6012
THAT'S SILVER-FLASH TYPE 329
3. BEING A WELDER I'D ASK FOR RODS ACCORDING TO AWS NUMBERS. BUT THOSE CONFUSING TRADE NAMES PUZZLED ME.
"That's why I like the Allis-Chalmers method of numbering Electrodes"
HERE'S ALLIS-CHALMERS E-6012

USE of standard American Welding Society classification numbers make Allis-Chalmers electrodes *easy to remember* and *easy to buy*. Every rod in the line is made for a definite AWS standard — and each rod is sold according to its official AWS number. There's no confusing trade name, no complicated numbering code. It's the *logical* way to handle electrodes.

Smooth-flowing and with quiet arc characteristics, these electrodes are available in both a-c and d-c types. They're *shop-tested* and *production-proven* in Allis-Chalmers own huge plants. Our nearby welder dealer or A-C district office can supply you. Write for bulletin B6340. A 1779

ALLIS-CHALMERS MILWAUKEE 1, WISCONSIN

HEADQUARTERS FOR WELDING EQUIPMENT

AMPAC A-C WELDERS

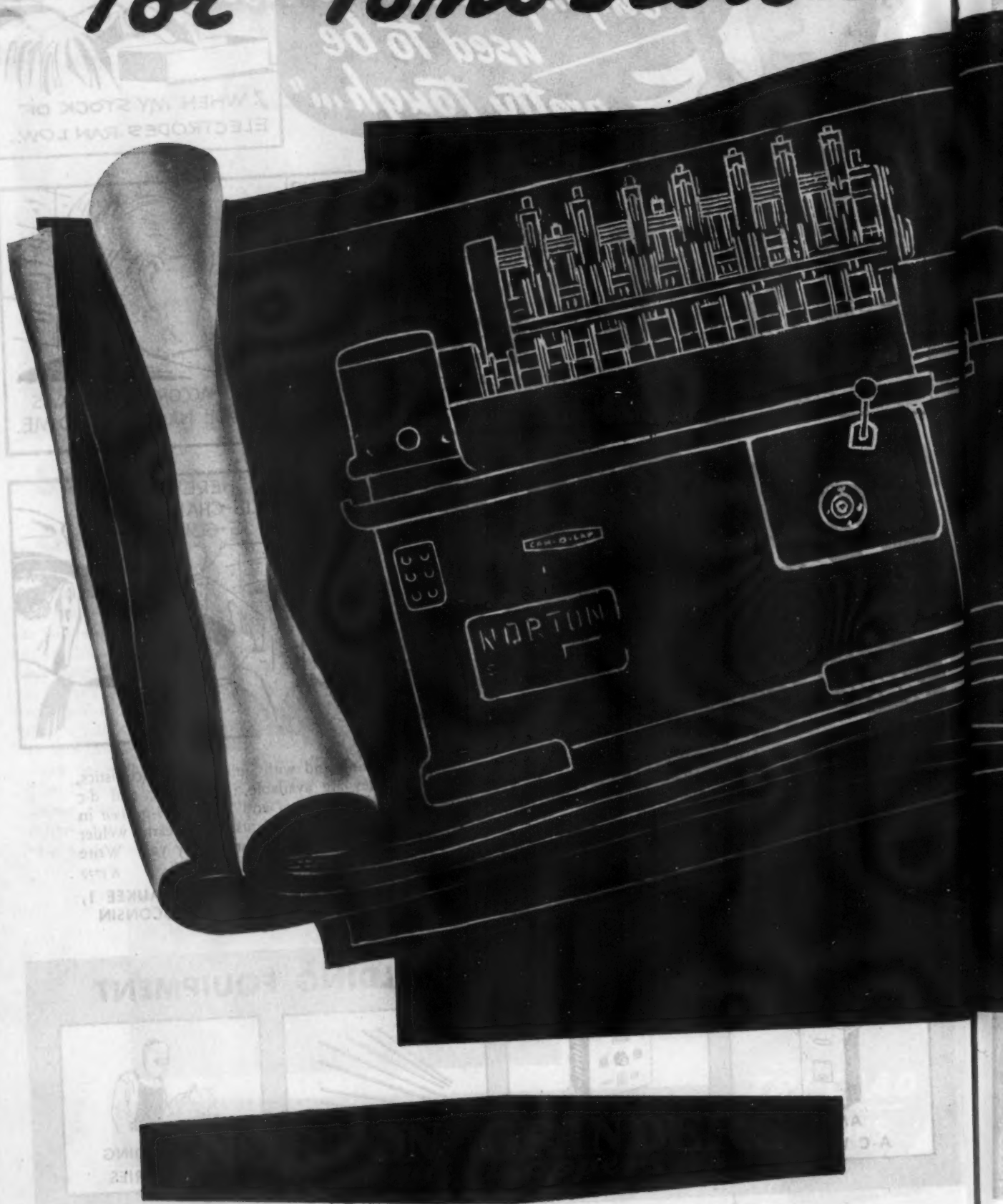
WELD-O-TRON D-C WELDERS

ALLIS-CHALMERS ELECTRODES

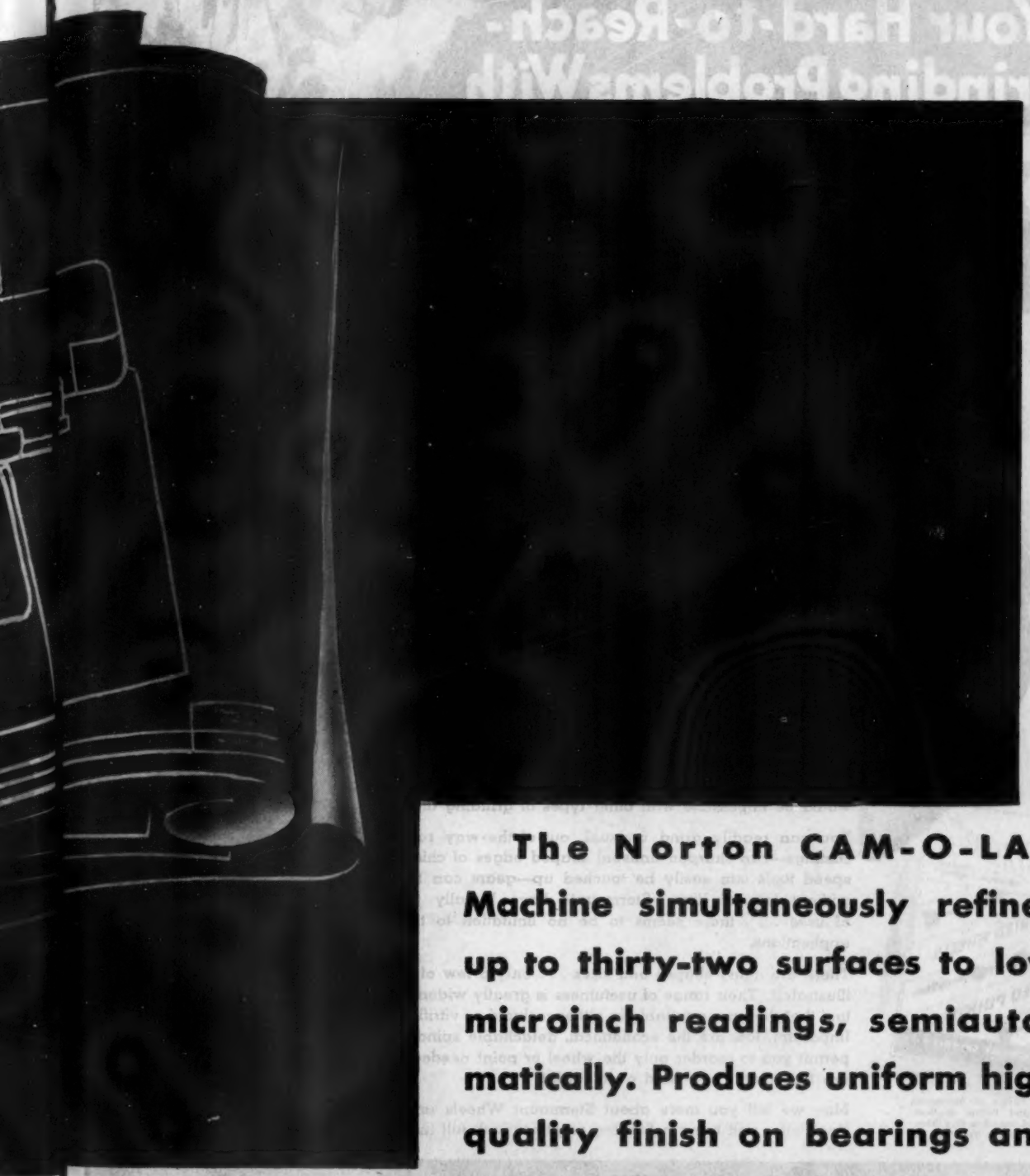
ARC WELDING ACCESSORIES

♪ *Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.*

For Tomorrow's



Production . . .

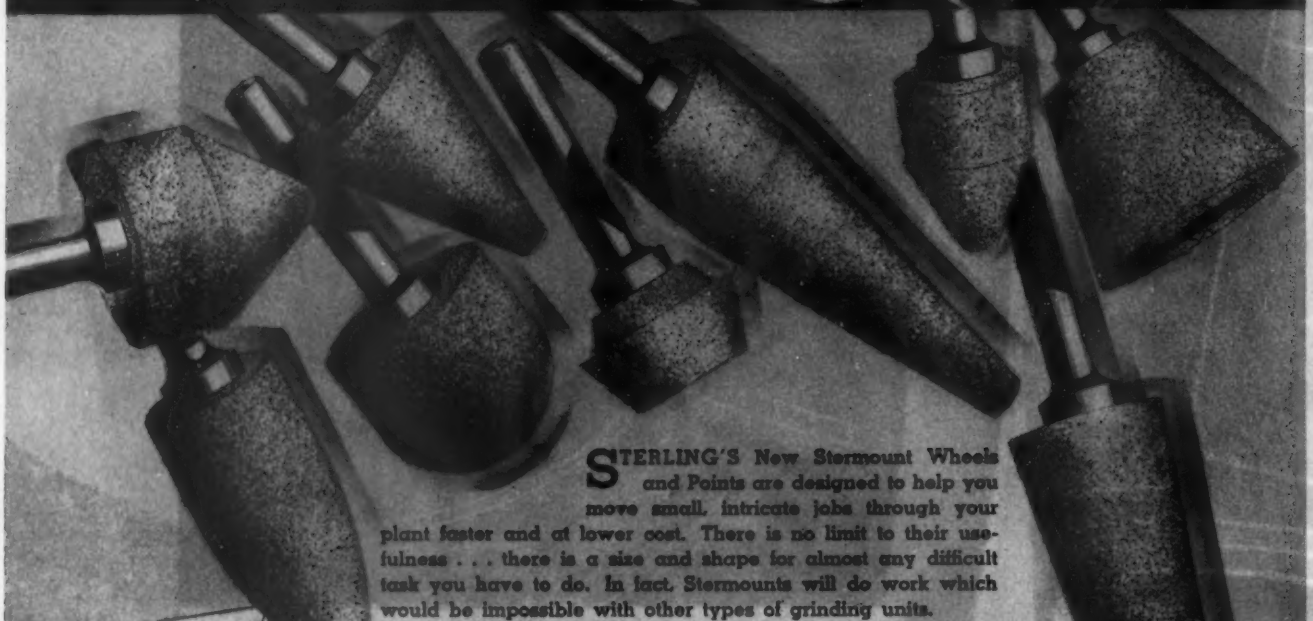


The Norton CAM-O-LAP Machine simultaneously refines up to thirty-two surfaces to low microinch readings, semiautomatically. Produces uniform high quality finish on bearings and cams at the same time.

NORTON COMPANY, WORCESTER 6, MASS.

M-492

You Can Easily Solve Your Hard-to-Reach-Grinding Problems With STERMOUNTS



Complete range of Stermount Wheels and Points is illustrated and priced in this three-colored folder. Send for it today.

STERLING'S New Stermount Wheels and Points are designed to help you move small, intricate jobs through your plant faster and at lower cost. There is no limit to their usefulness . . . there is a size and shape for almost any difficult task you have to do. In fact, Stermounts will do work which would be impossible with other types of grinding units.

You can readily grind unusual, out-of-the-way recesses in castings—can sharpen unusual shaped edges of chisels—high speed tools can easily be touched up—gears can be nicked without loss of time. Stermounts have literally thousands of uses . . . there seems to be no limitation to their shop applications.

There are many shapes and sizes . . . only a few of them are illustrated. Their range of usefulness is greatly widened by the fact that they are available in either resinoid or vitrified bonds. Important, too, are the economical, detachable spindles which permit you to reorder only the wheel or point needed . . . you use the spindle over and over again!

May we tell you more about Stermount Wheels and Points? Your letter will bring a Sterling engineer with full information.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

Consult METRO

About Your Tool and Gage Requirements

Cylinder Plug Gages

Special Gages

Metro's long experience, sound engineering practice and skilled craftsmanship insure that *your* Metro Gages and Tools, whether stock items or designed and made up for special jobs, will fully meet your most exacting requirements for precision and accuracy—and help you meet and beat your production schedules. For information on special tools and gauges, when you need them, *ask Metro.*

Metro Standard Gages and Carbide Tipped Tools are available for immediate delivery through your Metro distributor.

Carbide Tools

Write for Free Catalog Today

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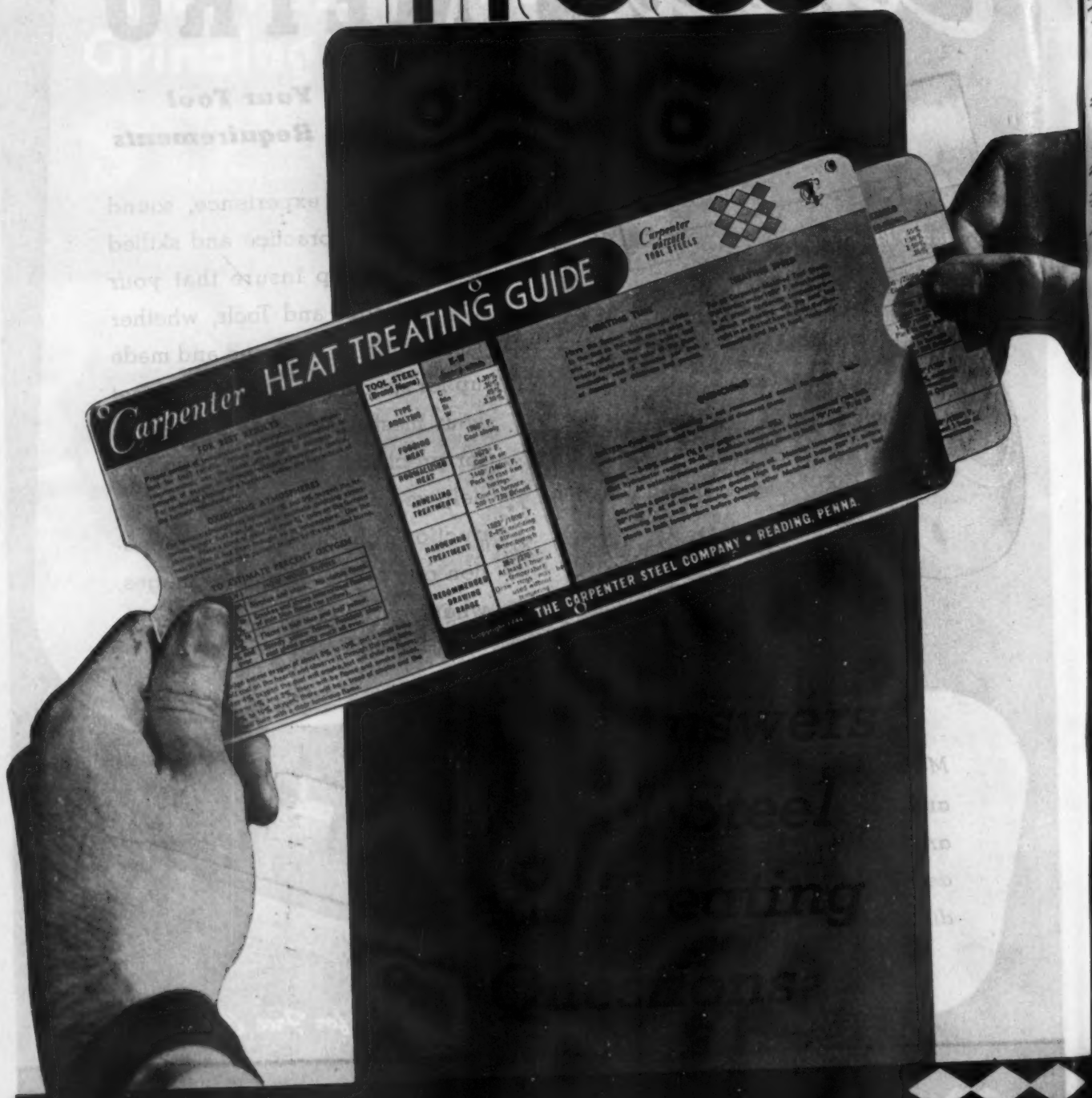


Carpenter MATCHED TOOL STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

. . . correct heat treating data safeguards your tool performance

Whether you get 100% tool performance or 10% tool performance may depend upon the final heat treatment. Since excessive costs, frequent machine shutdowns and decreased output can result from improper heat treatment, proper tool hardening is of utmost importance.

Carpenter has always made available to the tool designers and tool engineers complete information on the heat treatment of the Matched Tool Steels. The new Heat Treating Guide presents this information in handy slide chart form for your heat treaters ready reference.

The compact tabulation tells at a glance for each matched tool steel:

Type analysis
Forging heat
Normalizing heat
Annealing treatment
Hardening treatment
Recommended drawing range

It specifies definite temperatures and procedures. Operating tips are given on quenching, how to estimate oxidizing atmospheres, heating time and heating speed for drawing. Important information on the effect of drawing temperature on hardness is presented in a new manner which shows at a glance the hardness for different drawing temperatures.

All this information is available in this pocket size Heat Treating Guide. Every man responsible for the heat treatment of Carpenter Matched Tool Steels should have one. It will help get the best production results out of your tools by minimizing heat treating errors.

Just as the Carpenter Matched Set enables the tool steel user to get maximum results in the selection of the proper tool steel, the specific hardening data of the Heat Treating Guide enables the heat treater to get maximum hardening results. Just fill in the coupon and mail it to us or write on your company letterhead for your Heat Treating Guide. (Free to tool steel users in the U. S. A.)

THE CARPENTER STEEL COMPANY
109 W. Bern St., Reading, Penna.

Please send me free, and without obligation, the new Carpenter Tool Steel Heat Treating Guide.

NAME.....TITLE.....

COMPANY.....

STREET.....

CITY.....ZONE.....STATE.....

(PLEASE PRINT)

Ohio Revolving Tables are now being shipped with reasonable promptness.

OHIO REVOLVING TABLES

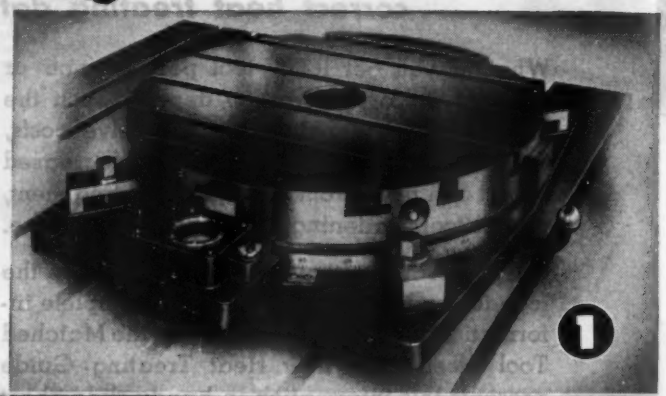
OHIO'S STEP UP PRODUCTION

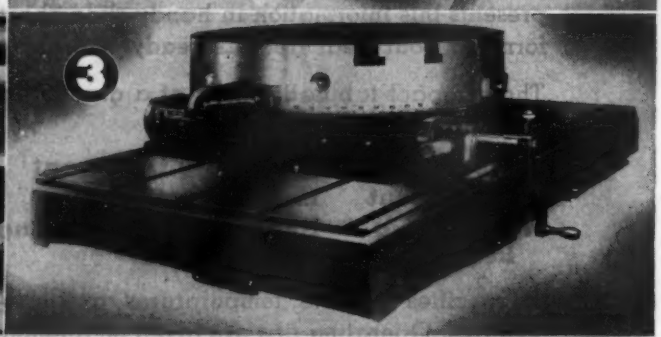
Ohio Revolving Tables are available in round and square types from 24" through 96", with many combinations. They are truly precision units accurately graduated in half degrees. They can be supplied with indexing pins with any number of indexing positions or precision dial indexing units. They can be arranged for use with horizontal or vertical boring, drilling and milling machines and many other types illustrated.

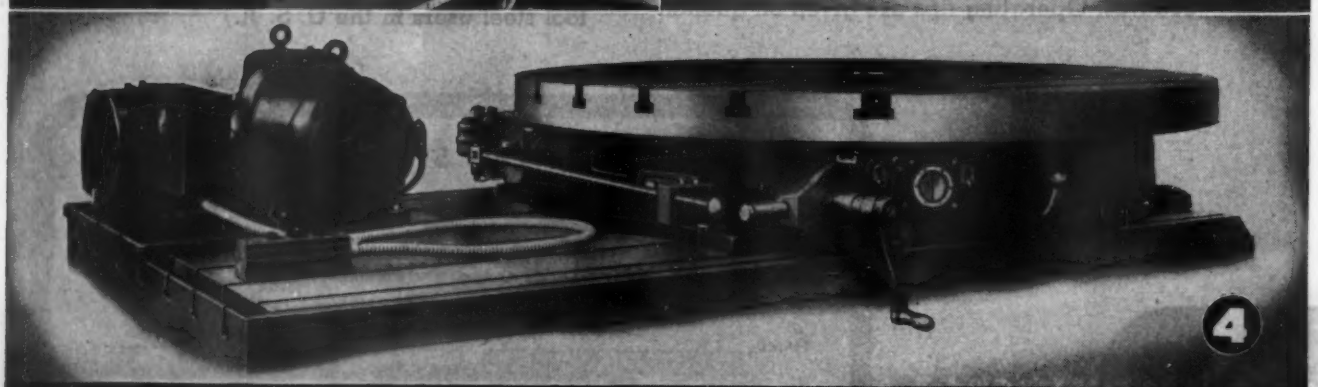
(1) 30" diameter revolving table on base plate with precision dial and anti-friction raising device; 24", 36", and 48" similar. (2) 36"x 48" square worm feed revolving table with index pin and bracket, 4 index pin positions, worm throw-out, and anti-friction raising device. (3) 36" diameter worm feed revolving table with index pin and bracket, 4 index pin positions, worm throw-out, and anti-friction raising device. (4) 72" diameter worm feed revolving table with precision dial, worm throw-out anti-friction raising device, and power feed.

We'll be glad to send you Bulletin 375.

THE OHIO MACHINE TOOL CO., KENTON, OHIO







OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

for longest wear use *Firthite*

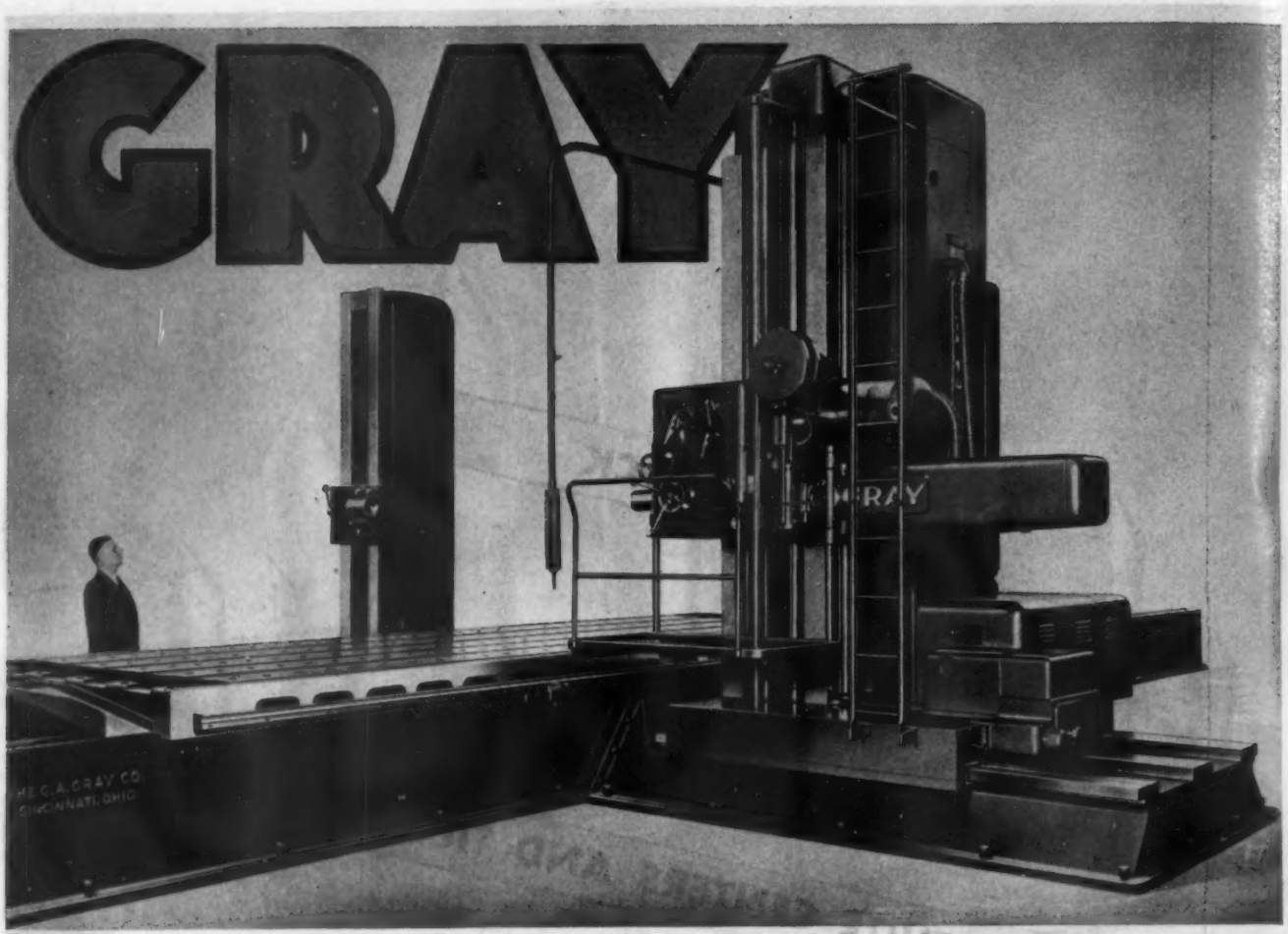
Whether you buy finished centers or carbide tips for making your own, you can now obtain immediate shipments of FIRTHITE from complete stocks. Finished FIRTHITE Centers are available with three tapers—Morse, Jarno, or Brown and Sharpe. To secure the maximum resistance to wear, or long life, specify **FIRTHITE Grade T-41**—"tops" for centers.

ARMY-NAVY E

Firth-Sterling

STEEL COMPANY

OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA PITTSBURGH DAYTON DETROIT



Planer-Type BAR MACHINES

These Planer-Type Horizontal Boring, Drilling and Milling machines feature the Gray patented "Stub Shaft Spiral Geared Drive" for table.

The spiral gear meshing directly with the table rack gives enduring smoothness of motion and is so designed as to be self-locking under all conditions. The spiral gear is mounted on a very short, heavy stub shaft running in anti-friction bearings and this shaft is driven by hardened and lapped alloy steel hypoid gears. This construction has 3 distinct advantages—

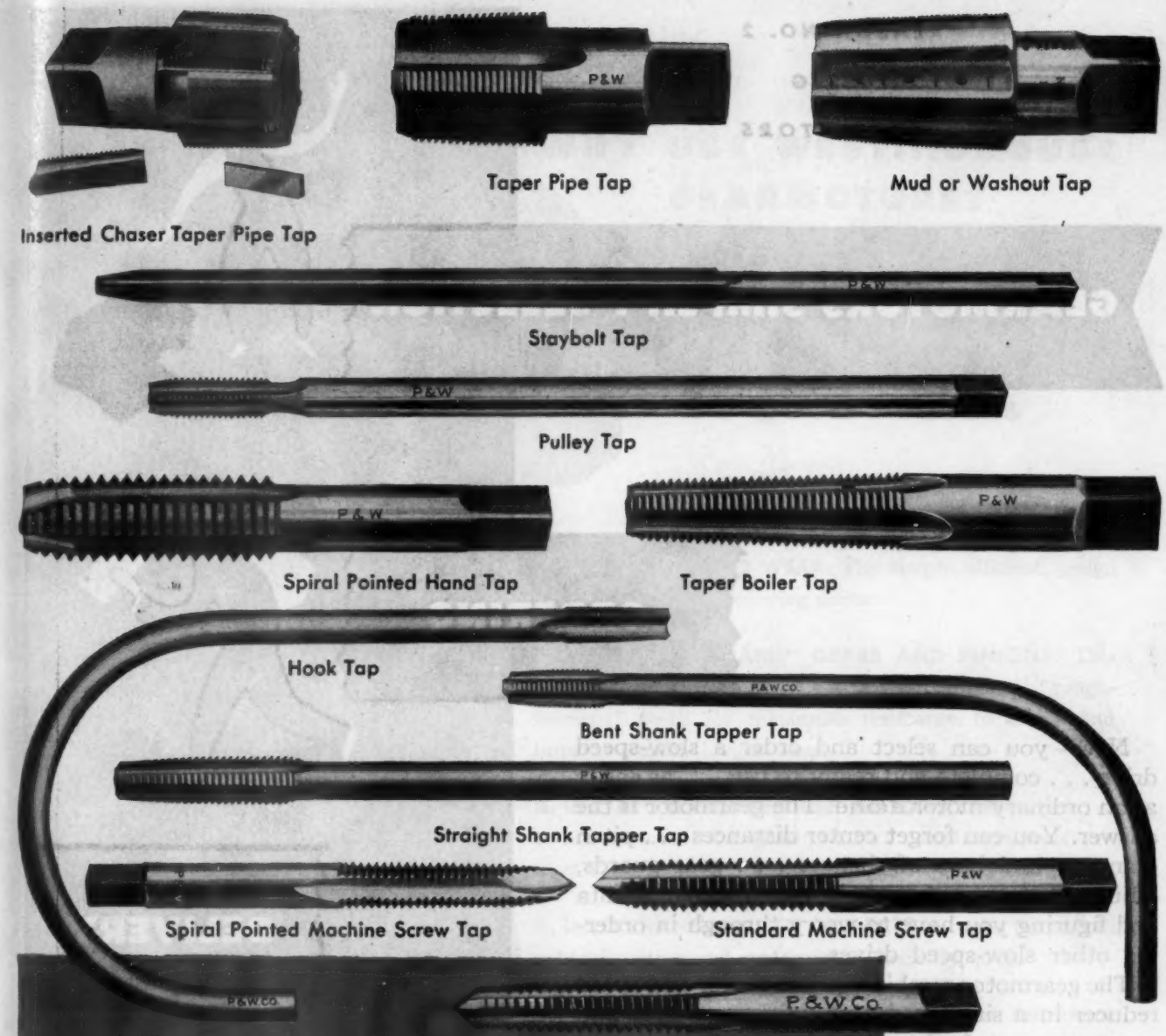
1. A heavy stub shaft can be used to drive the spiral pinion, thus giving a minimum of torsional wind up.
2. The spiral gear can be placed high in the bed, making possible the use of a small diameter spiral gear, having maximum efficiency, without lowering the position of the table rack relative to the work. Placing the spiral gear cradle high up in the bed also locates the heavy horizontal bed plate, on which it rests, high up in the bed—greatly stiffening the entire bed structure at this vital point.
3. The hypoid pinion shaft can be made of large diameter and still allow ample depth of metal under the bed vees.

Standard planer type machines are furnished with either 5" or 6" diameter bars and with tables of from 32" to 74" in width and of any length.

WRITE FOR OUR NEW BULLETIN NO. 48.

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines



Inserted Chaser Taper Pipe Tap

Taper Pipe Tap

Mud or Washout Tap

Staybolt Tap

Pulley Tap

Spiral Pointed Hand Tap

Taper Boiler Tap

Hook Tap

Bent Shank Tapper Tap

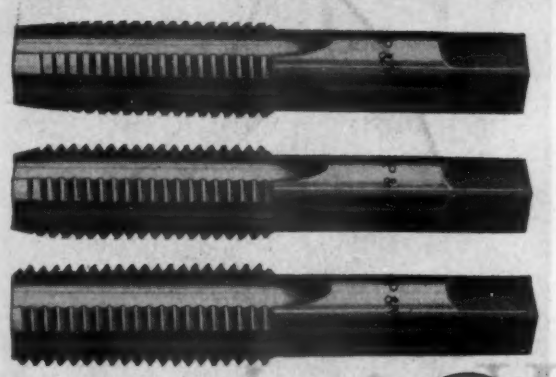
Straight Shank Tapper Tap

Spiral Pointed Machine Screw Tap

Standard Machine Screw Tap

Standard Hand Tap

A COMPLETE SERVICE ON TAPS



Standard Hand Taps

Pratt & Whitney taps include all kinds . . . the right one for any tapping operation regardless of material or the desired accuracy. Each one is a combination of proper design, top quality steel, scientific heat treatment and fine craftsmanship. For lowest cost per tapped hole . . . for trouble-free production . . . specify P&W taps.

Illustrations show a few of P&W's wide variety of taps. **Ask for complete listings of sizes and prices.**

PRATT & WHITNEY

Division **Niles-Bement-Pond Company**

WEST HARTFORD 1 • CONNECTICUT

REASON NO. 2

FOR USING

GEARMOTORS

GEARMOTORS SIMPLIFY SELECTION

ORDERING

DELIVERY

Now—you can select and order a slow-speed drive . . . complete and ready to use . . . as easily as an ordinary motor *alone*. The gearmotor is the answer. You can forget center distances . . . pitch diameter and bore of sheaves . . . gear guards, adjustable bases . . . and all the complicated data and figuring you have to worry through in ordering other slow-speed drives.

The gearmotor combines prime mover and speed reducer in a single compact unit . . . motor and gears are *matched* to the job.

Because you spend much less time selecting and ordering the *right* speed reduction equipment—the gearmotor gets onto the job and into production sooner.

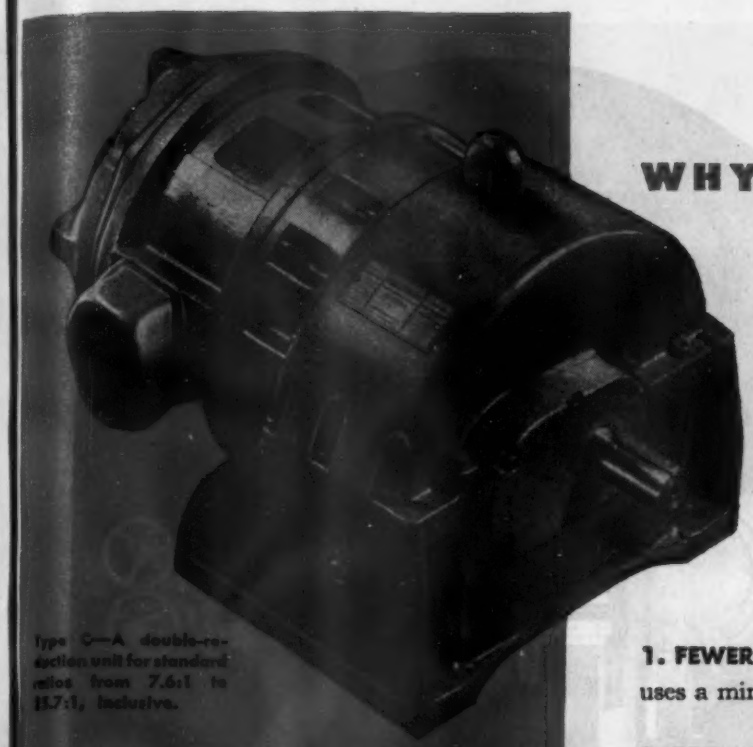
Ask your Westinghouse representative about this and many other basic gearmotor advantages. All of these are discussed in detail in new gearmotor handbook, "Gearmotor Applications". A copy will be sent on request. Ask for B-3218. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-07219

REASON NO. 1—GEARMOTORS SAVE SPACE

Third of a series sponsored by Westinghouse to promote the use of gearmotors.

The New Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



Type C—A double-reduction unit for standard ratios from 7.6:1 to 15.7:1, inclusive.

Type A—This single-reduction gearmotor is available in standard gear ratios from 1.22:1 to 6.25:1, inclusive.

Type E—Double-reduction gearmotor available in standard ratios from 31.2:1 to 58.3:1, inclusive.

Gearmotors

WHY USE WESTINGHOUSE GEARMOTORS?

. . . check these 10 good reasons

1. FEWER PARTS TO WEAR. The simple, efficient, design uses a minimum of moving parts.

2. BPT "TOUGH-HARD" GEARS AND PINIONS. This exclusive Westinghouse heat-treating method "tough-hardens" teeth for maximum resistance to shock and impact—means longer wear.

3. USE ALL WESTINGHOUSE MOTOR TYPES—open . . . totally-enclosed . . . splashproof . . . explosion-proof—to meet changes in operating conditions quickly and easily.

4. INTERCHANGEABILITY OF PARTS between unit types reduces your parts' replacement stock by 40%.

5. HIGH EFFICIENCY of gearing parts assures full motor horsepower at output shaft . . . only 2% power loss per gear set.

6. POSITIVE LUBRICATION of gears and bearings by automatic splash system reduces probable maintenance to twice-a-year change of oil.

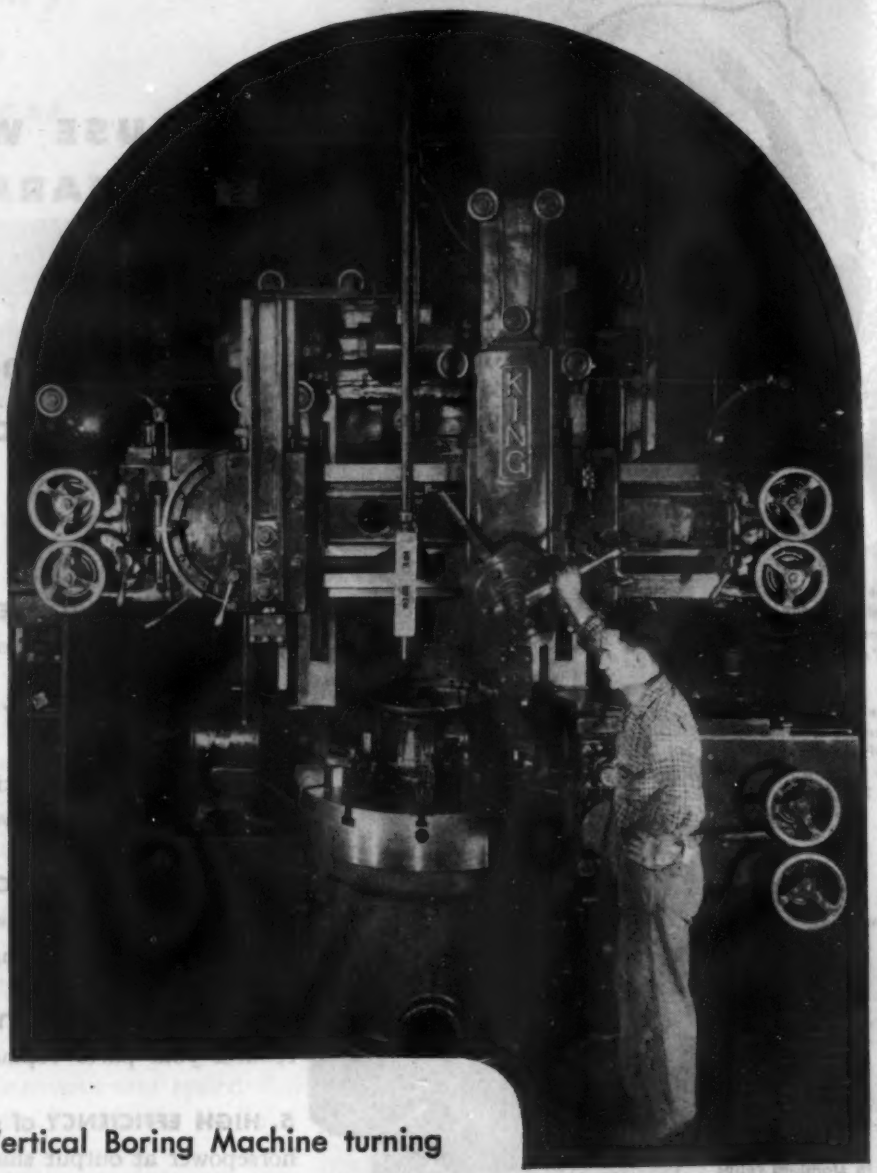
7. EASY ACCESSIBILITY. Gearing parts can be readily inspected or easily removed to make gear ratio changes.

8. IMPROVED FOUNDATION STABILITY. Feet are under the gear case . . . placing support next to the gearmotor load. Each foot is reinforced by external ribs.

9. UNIT RESPONSIBILITY for design . . . manufacture . . . and service. Westinghouse builds both motor and the gears.

10. MEET A.G.M.A. STANDARDS. The new Westinghouse Gearmotors are specifically designed and built to meet A.G.M.A. standards . . . easy to order and match to the job.

KING 42" VERTICAL BORING & TURNING MACHINE



● Illustrated is a King 42" Vertical Boring Machine turning bearing housing of an electric motor for motor starter fit. Material is cast steel.

This is one of a number of jobs being turned on this machine and also one of a number of King Boring & Turning Machines in operation in this plant.

In your future plans for the manufacture of consumer goods it will pay you to look into the many advantages of King Vertical Boring & Turning Machines.

Where precision—speed—power are essential to your production put the job on a King.

• KING BUILDS •

Vertical Boring and Turning Machines exclusively in single column types from 30" to 42"—double column types up to 12 feet.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

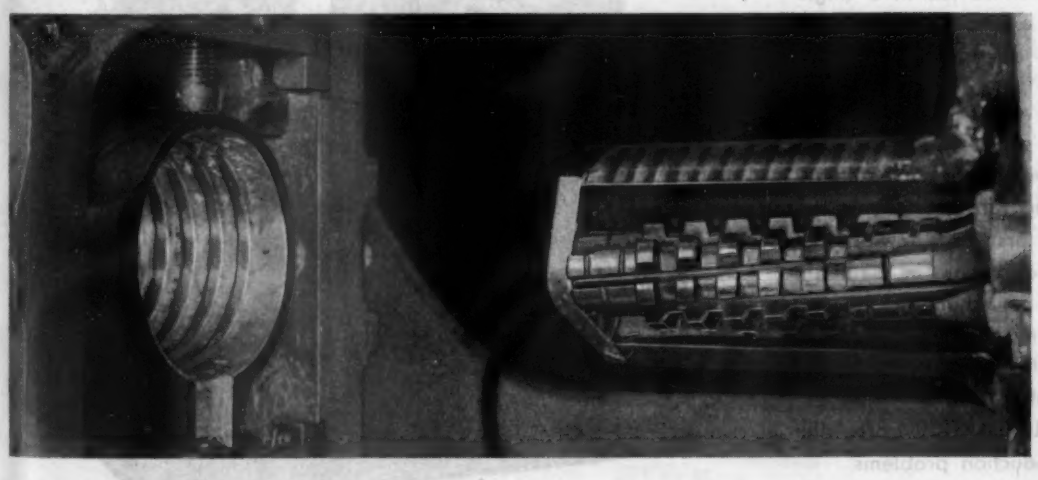
BARBER-COLMAN THREAD MILLING CUTTER...

SPEEDS UP WORK AND HOLDS EXTREMELY CLOSE ACCURACY WITH EXCELLENT FINISH on 75MM. GUN BARREL BREECH RINGS

SET-UP...

This piece is thread milled internally as shown below. The cutter is supported in a special holding fixture which provides the necessary outboard bearing. Three cuts are taken, removing successively .155", .055", and .005" material. The cutter runs at 42 r. p. m. and the feed is 1.156" per minute. It takes 14 minutes to complete each of the 3 cuts. After each 10 completed pieces, the cutter is sharpened.

Previously turned, these internal threads in 75mm. breech rings are now formed faster by thread milling, using B-C Multiple Thread Milling Cutter shown above. The piece is a tough alloy steel forging, 300 - 325 Brinell. Accuracy requirements are very close, being ± .0005" cumulative on pitch, ± .00025" on depth, and ± .002" per foot lead error. Finish must be excellent. To meet these difficult conditions, Barber - Colman engineers designed this ground flange type thread mill. Teeth are precision ground all over to limits exceeding the accuracy of the work. Face grinding for sharpening does not alter the accuracy of the cutter as long as gash index is closely held. This is another example of B-C design-engineering experience as applied to complex production problems, with outstanding results.



Buy War Bonds

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

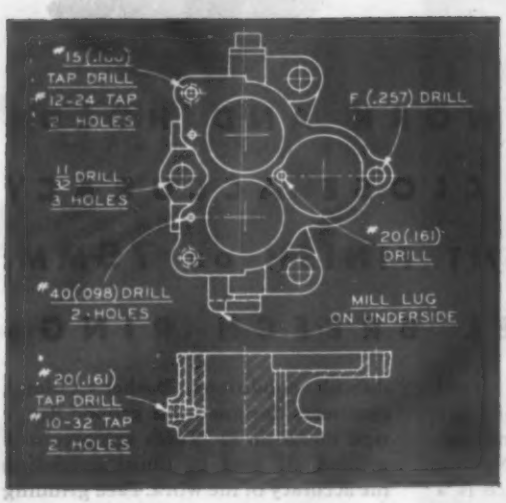
Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

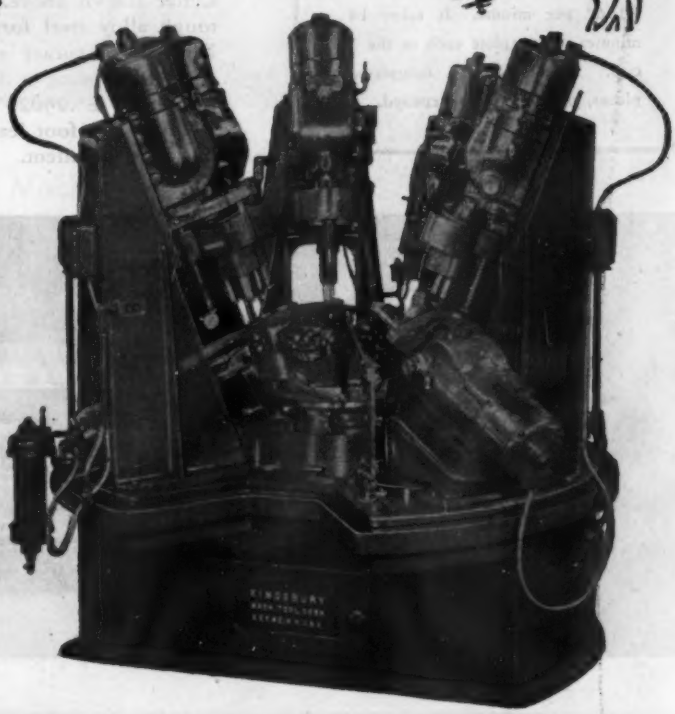
FLEXIMATIC

The THRIFTY *Way*

To Solve Production Problems



THIS IS A FLEXIMATIC JOB!



Over a dozen operations on the carburetor throttle valve bodies shown — and Kingsbury FLEXIMATICS perform the entire job in a single chucking of the work! An example of the thrifty way to solve multiple - operation production problems.

FLEXIMATICS are built up of standard Units, set up on a standard base around an automatically indexing work-holding turret. This unit system of construction keeps first costs low—out of the "special machine" class. And in addition, FLEXIMATIC Units can be changed, moved around and mounted in any combination on the base to meet the machining requirements of many different parts. That is why we say that **flexible automatic** FLEXIMATICS are the THRIFTY way to solve production problems.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

9 INCH
SOUTH BEND
Precision
LATHE

. . . . FOR THE MANUFACTURE OF SMALL ACCURATE PARTS IN PRODUCTION SHOPS

. . FOR PRECISION OPERATIONS IN TOOLROOMS, EXPERIMENTAL SHOPS, AND LABORATORIES

9 INCH MODEL A

SOUTH BEND LATHE FEATURES

Fine workmanship by experienced machine tool craftsmen.

Superfinished spindle with large bearings.

Direct belt drive to spindle for smooth, quiet operation at high speeds.

Back-geared drive for heavy cuts and low spindle speeds.

Full quick change gear mechanism.

Thread cutting range—4 to 224 per inch, right hand and left hand, 48 pitches.

Precision lead screw for thread cutting.

Worm drive and friction clutch for power longitudinal feeds and power cross feeds.

Three hand-scraped V-ways and one flat way on the bed insure perfect alignment of headstock, saddle, and tailstock.

Whether your problem is the quantity production of small, accurate parts, or the efficient machining of small work in the toolroom, experimental shop, or laboratory, you will find a lot of possibilities in the 9-inch South Bend Lathes. Modern in design, built with the same care as the larger sizes of South Bend Lathes, they are fast, accurate, and versatile. Substantial savings in capital investment, power consumption, floor space, and labor costs have often resulted from their installation.

In addition to the 9-inch Lathes, we manufacture 10″, 13″, 14½″, and 16″ lathes in Quick Change Gear and Toolroom types. Also the Series 900 and Series 1000 Precision Turret Lathes having ½″ and 1″ collet capacity respectively. Write for a catalog, stating the size and type of lathe you need.

TRAINING HELPS

Sound films, operator's handbooks, wall charts, booklets, and bulletins on lathe operation and care are available for training new lathe operators. Write for Bulletin No. 21-D for full information.

ARMY E NAVY

SOUTH BEND

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 38 YEARS • SOUTH BEND 22, INDIANA

death trap...

FOR LOADED DICE!

YOU can spot them in a second! Where honest dice turn slowly and evenly when dropped in a glass of water, "phonies" make one quick revolution, then settle with the weighted sides down. A simple test, but effective.

Not so simple was the task of trapping "loaded" parts in high-speed machinery—detecting unbalance and trouble in a part that whirls at several thousand r.p.m.!

GISHOLT DYNETRIC BALANCING MACHINES* provide the answer quickly and economically. They *locate* and *measure* any false movement—unbalance vibrations, even down to .000025" . . . and in a matter of seconds. Then:

Out goes vibration, major cause of excessive wear and early failures. In comes accurate static and dynamic balance, without which your machines—like loaded dice—are "stacked against you."

Take no chances with vibration! Investigate *Gisholt Dynetric Balancing now!*

**A development of the Westinghouse Research Laboratories*

GISHOLT MACHINE COMPANY

1201 East Washington Avenue • Madison 3, Wisconsin

GISHOLT

***DYNETRIC BALANCING MACHINES** are extremely easy to operate. A simple meter reading, and the slightest unbalance is revealed . . . in any part from 1 ounce to 50 tons. Literature on request.*

Look Ahead.:.Keep Ahead.::With Gisholt Improvements in Metal Turning

BASE FOR HORIZONTAL POSITION

HARDINGE

Horizontal-Vertical Collet Index Fixture

with Threaded Nose Spindle

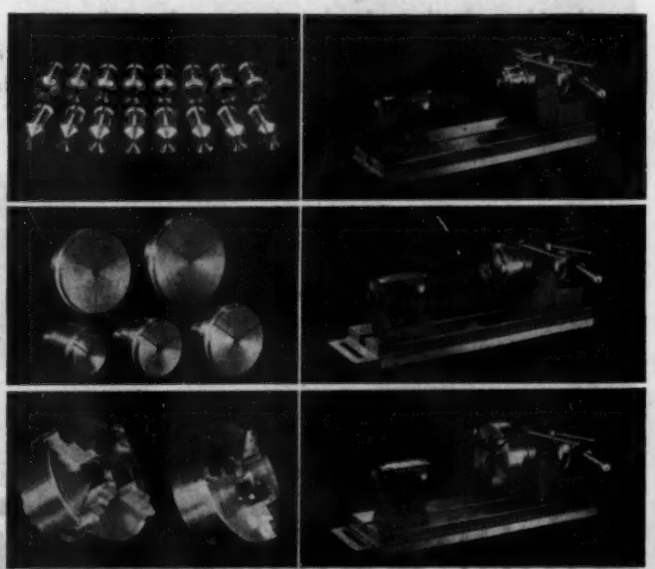
In addition to taking standard collets, this fixture takes step chucks and jaw chucks to cover a wide range of applications.

The purchase of this fixture will eliminate the necessity of your tool room making many specially designed fixtures. Thus, your engineers and tool-makers will have more time for other work.

A preselector arrangement provides the selection of separate indexing of any number divisible into 20 or 24.

The collet closer lever has a 100 to 1 leverage for quick opening and closing of collets and step chucks.

Write for complete bulletin



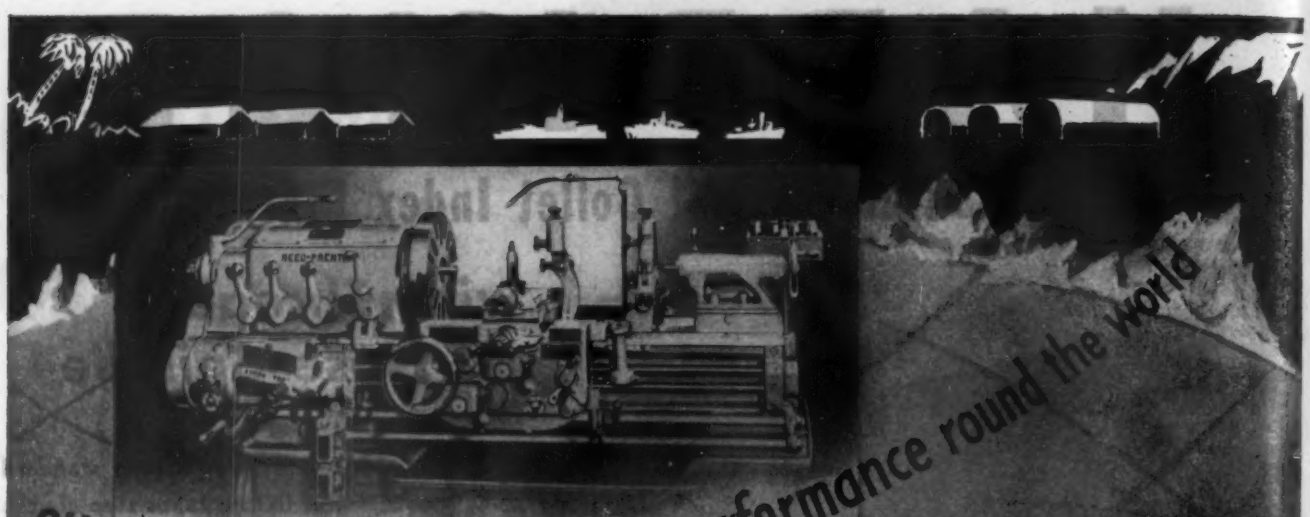
1" COLLET CAPACITY: 1/16" to 1" in any fractional or decimal size. The set of collets illustrated is by 16ths only. Special shape and stop type collets are also furnished.

6" STEP CHUCK CAPACITY: 2", 3", 4", 5", and 6" Step Chucks and Closers are used with this fixture. These chucks are operated by the same lever collet closer that operates the collets. Furnished stepped to desired specifications or customer can apply required step or steps.

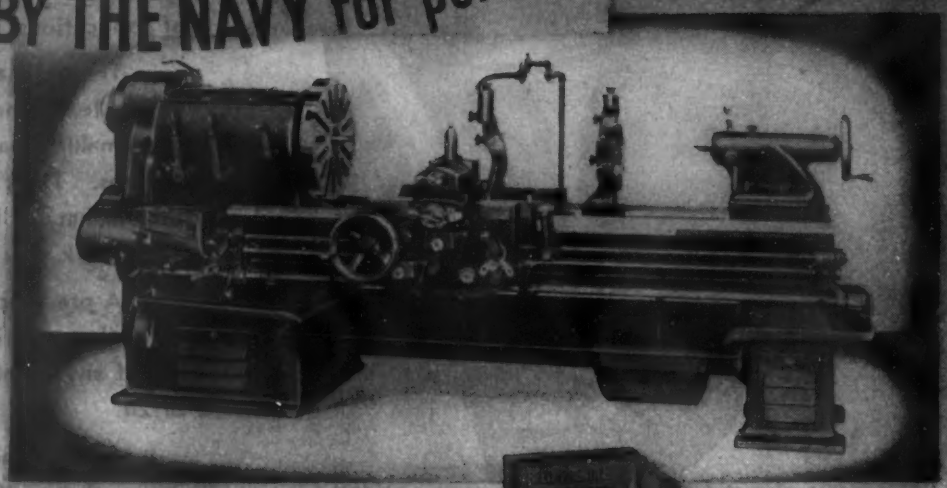
5" JAW CHUCK CAPACITY: Universal and Independent Jaw Chucks applied to the spindle nose have a 5" capacity. The chucks embody the Hardinge feature of integral mounting which decreases overhang and increases accuracy.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



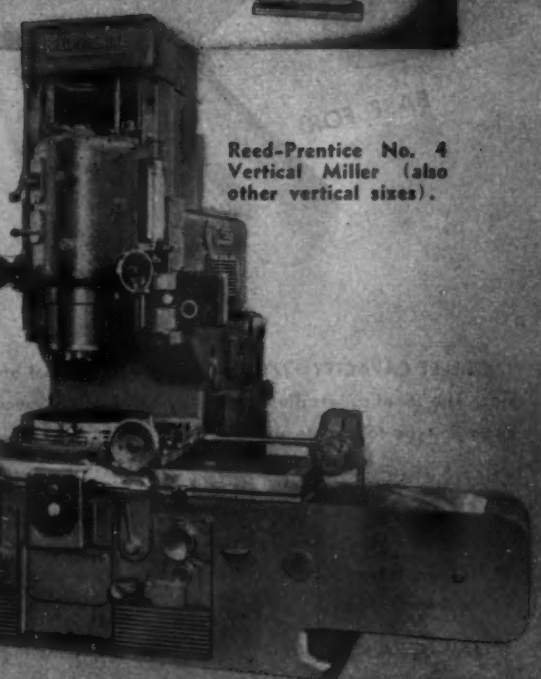
CHOSEN BY THE NAVY for performance round the world



Above: Reed-Prentice model B precision 14" Sliding Gear Head Lathe. Also made in 16" size.

Right: Reed-Prentice Model A precision 20" Sliding Gear Head Lathe.

When the Navy calls for machine tool equipment, precision machines alone meet the specifications. Because of recognized qualities and performance records, scores of Reed-Prentice 14", 16" and 20" Lathes, and Vertical Milling Machines are in the service of the Navy, both on land and at sea. Reed-Prentice "Timberhog" Saws are also indespensible in varied jobs of cutting heavy timbers efficiently and economically.



Reed-Prentice No. 4 Vertical Miller (also other vertical sizes).

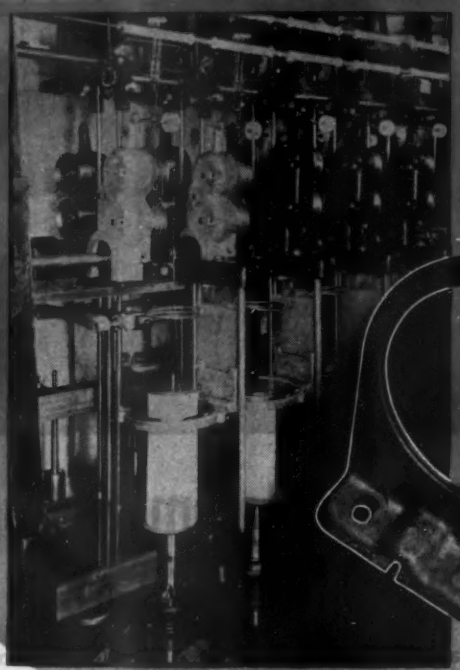
Reed-Prentice Portable Air Driven "Timberhog" Saw (also electric and gas).

REED-PRENTICE CORP. WORCESTER 4, MASS.

NEW YORK OFFICE: 75 West St., New York 6, N. Y. • CLEVELAND OFFICE: 1213 W. 3rd St., Cleveland 13, Ohio

"Stopping on a Dime"

is too slow for the War-Time Textile Industry



Zero inertia for reciprocating parts would give the machine designer an ideal condition. No slowing down for the turns. Parts could jump from full speed in one direction to full speed in the other.

Magnesium goes a long way toward providing that kind of equipment. The ring holders shown above, for example, are so light in weight that their direction of travel can instantly be reversed without much worry about inertia. Spinning and twisting machines can be run at higher speeds without setting up excessive vibration. Production is greater, quality higher, machine life longer.

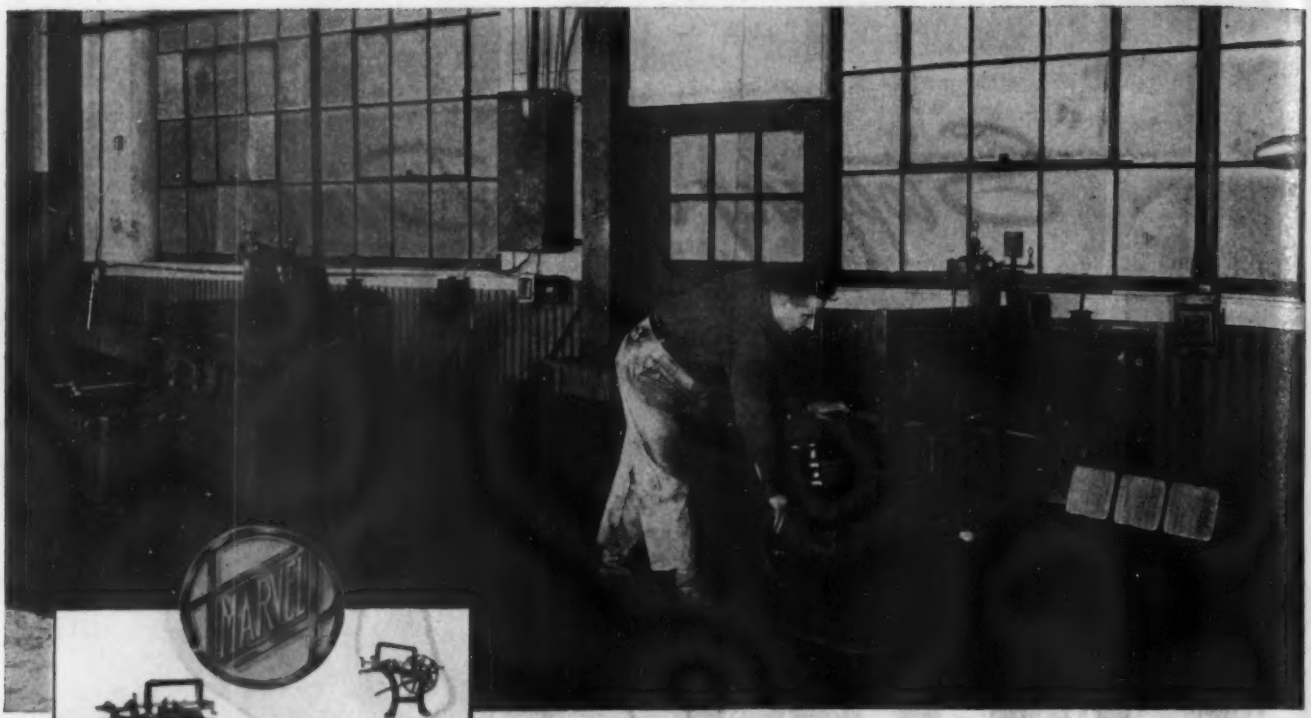
Die cast by American Magnesium Corporation, these parts are light, strong and accurate. They are ready to go to work after a minimum of machining. Fabrication costs are low.

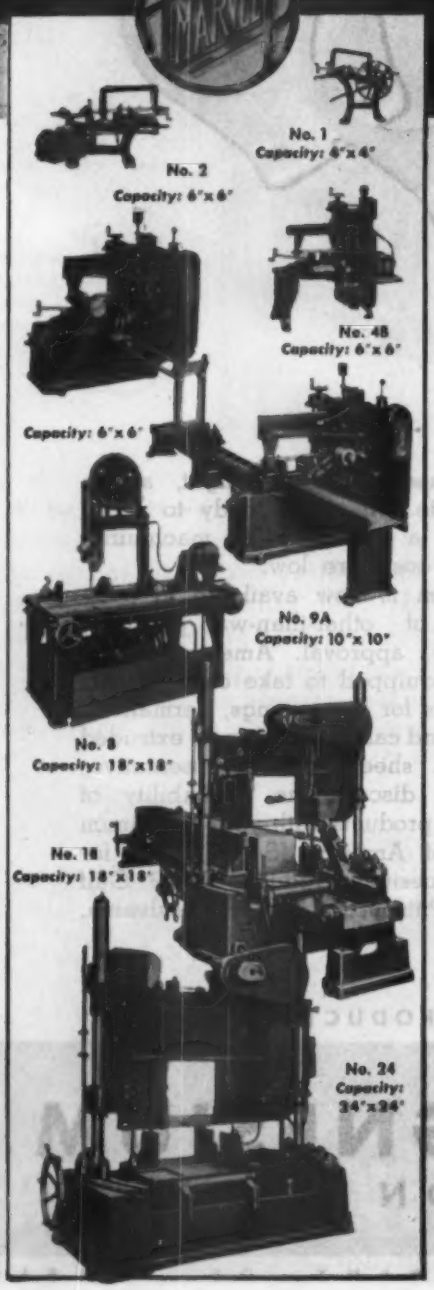
Magnesium is now available to manufacturers of other-than-war products, with W.P.B. approval. American Magnesium is equipped to take care of your requirements for die castings, permanent-mold and sand castings, forgings, extruded shapes and sheet. Our representatives will gladly discuss the availability of magnesium products with you. Aluminum Company of America (Sales Agent for Mazlo Magnesium Products) 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA





Keep 8 Drop Hammers Supplied with Forging Steel

At the Chicago plant of the Atlas Forgings Company, two MARVEL No. 9 High Speed Hack Saws, equipped with heavy duty work handling equipment, keep 8 drop hammers supplied with forging steel. The Atlas Forging Company (like most of the other leading forge plants of the country that have accepted MARVEL Saws as standard), have found that the hack saw method of cutting steel TO EXACT WEIGHTS is far more efficient and economical than with any other method formerly used by the industry.

With these two MARVEL High Speed Saws one operator can keep all 8 drop hammers supplied with EXACT SIZE billets and still have time for other work. The initial investment is small—and the cost per cut is unbelievably low. Contrast this with the old method of cutting-off, requiring a "crew" of hammer men for each drop hammer in the shop, and where the loss of steel was tremendous.

The MARVEL Saws shown above have found special favor with the forging industry and Machine Shops where heavy demands are put on hack sawing machines. This MARVEL Saw, with its rugged work handling equipment, will stand up under the heaviest punishment and for continuous 24 hour operation.

Write for Bulletins

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave. Chicago 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

WHY THE *Staples* EXPANSION REAMER HAS LONGER LIFE

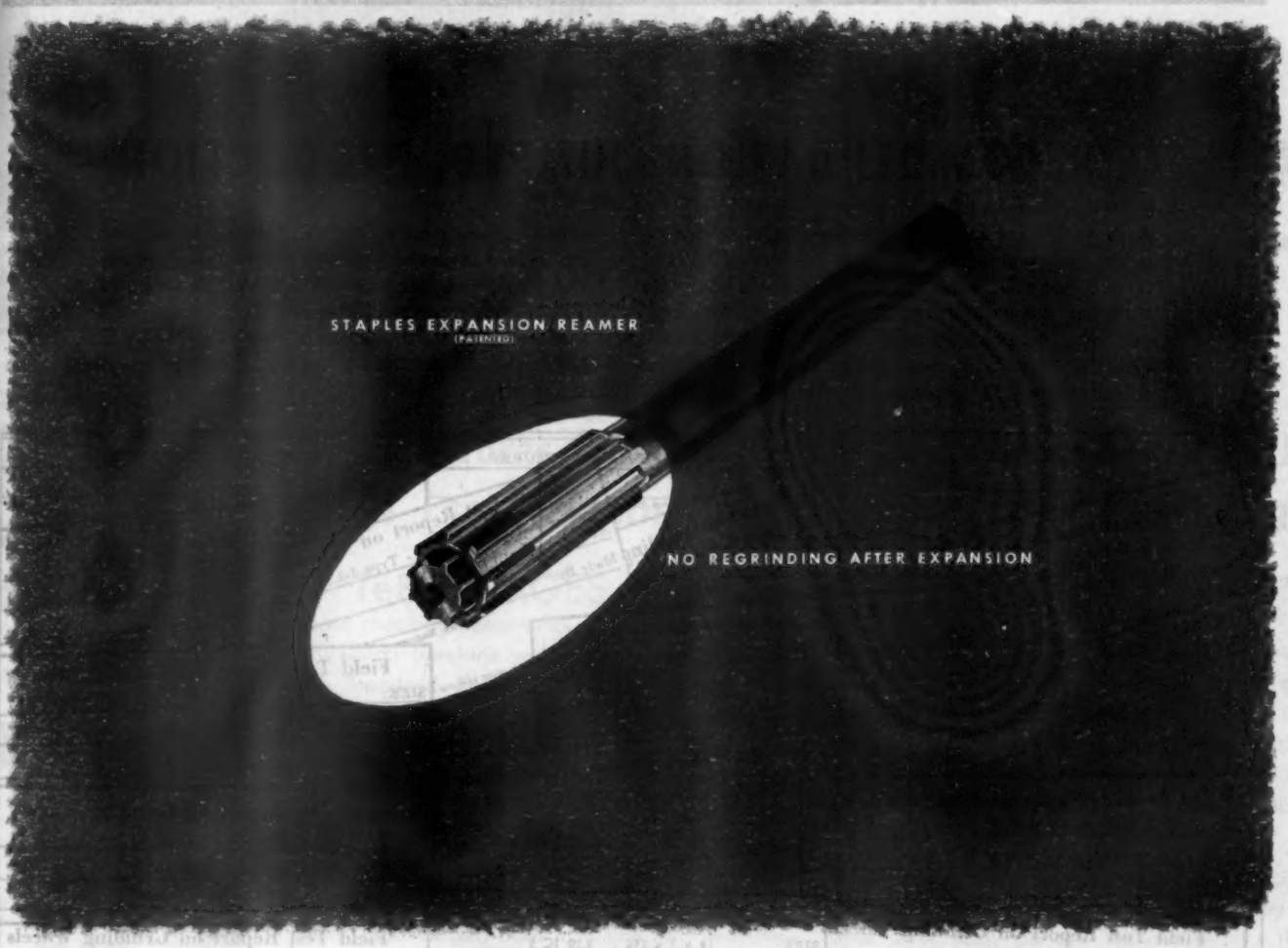
The Staples Expansion Reamer greatly outwears competitive reamers because after expansion it will still produce holes of precision accuracy without regrinding!

This saving of tool life results from the patented, exclusive Staples method of expansion. The full length of the tool tip is expanded outward uniformly. Each expansion further tilts the blades, presenting in effect a new cutting edge and reducing regrinding to a minimum.

Staples Precision Carboloy-Tipped Expansion Reamers and other cutting tools have been used for years in the aircraft engine industry, where utmost accuracy is a prime requisite. Now, due to increased production, we can offer these tools affording aircraft accuracy to other industries which appreciate the many advantages of using today's highest quality cutting tools.

Send for our Catalog No. 44, describing Staples Tools, and containing comprehensive data on reamer usage and design.

STAPLES TOOL & ENGINEERING COMPANY
CINCINNATI 25, ... OHIO



Staples **CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS**

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

DISTRIBUTORS: The Cameron & Barkley Co., Charleston, S. C., Jacksonville, Fla., Tampa, Fla., Miami, Fla.; G. F. Cotter Supply Co., Houston, Texas; J. E. Dilworth Co., Memphis, Tenn.; The John C. Eide Co., Minneapolis, Minn.; Empire Machinery & Supply Corp., Norfolk, Va.; Fuchs Machinery & Supply Co., Omaha, Neb.; General Carbides Company, Newark, N. J.; Machinery Sales & Supply Co., Dallas, Texas; Marshall Supply & Equipment Co., Tulsa, Okla.; The Mine and Smelter Supply Co., Denver, Colo.; Murray-Baker-Frederic, Inc., New Orleans, La.; A. N. Nelson, Inc., Brooklyn, N. Y.; Sager-Spuck Supply Co., Inc., Albany, N. Y.; Screw Machine Supply Co., Chicago, Ill.; Strong, Carlisle & Hammond Co., Cleveland, Ohio; Syracuse Supply Co., Syracuse, N. Y.; Sterling Supply Co., Detroit, Mich.; Muskegon Hdwe. & Supply Co., Muskegon, Mich.; Harold W. Kimball Co., Waterville, Me.; White Supply Co., Waterbury, Conn.; J. E. Hazeltine & Co., Portland Ore.; The L. A. Benson Co., Inc., Baltimore, Md.; El Paso Saw & Belting Co., El Paso, Texas.; Quinn & Quinn, Birmingham, Ala.

A MID-WEST
RECOMMENDATION JUMPED PRODUCTION

A large engine manufacturer was recently facing a serious production slow-down. A MID-WEST service engineer was called in to make a complete study of this manufacturer's operation. His engineering analysis showed a deficiency in the abrasive the firm was using and advised the manufacturer to replace it with a MID-WEST wheel. Result: production was jumped to an amazing extent and the finished product was rounder and straighter because the MID-WEST wheel cut free with little or no pressure.

Illustrated below are a few of MID-WEST ABRASIVE COMPANY'S reports from its service engineers.

At A METAL INDUSTRIES.

Field Test Report on
SIZE: 2.50 LY 6-6.
At A MILITARY ENGINE
Made By

A GYROSCOPE MANUFACTURER.

Field Test Report on Sanding
SIZE: No. 40 A/O Cloth X4 Rag. Brown 6" wide x 180" c
At A PRODUCTS COMPANY.
Made By

At A MOULDING COMPANY.
Made By

Field Test Report on Grinding Wheels
SIZE: 36 x 3 x 12 - Type 1-3.366 D-5-6
At ROLLING MILL
Made By

Field Test Report
SIZE: 600 - 98 X - 72 X - 39
A Motor Car Company —

Field Test Report on Grinding Wheels
SIZE: 7 x ½ x 1¼ 2.50 JY 6. 10 x ¾ x 3 2.50 JY 6
At AN AVIATION COMPANY

Field Test Report on Grinding Wheels
SIZE: 10 x ¼ x 3-2.4-KY-6.6 7 x ½ x 1¾-2.60-KY-6.6
A MOTOR COMPANY

Field Test Report on Grinding Wheels
SIZE: 7 x ½ x 1¼ 2.50 JY-6. 2.50 KY-6
At A SUPPLY COMPANY
Made By

Field Test Report on Honing Stone and Grinding Wheel
SIZE: 2.50 KY-6 7 x ½ x 1¼
At CANADIAN GUN PLANT
Made By

Field Test Report on Grinding Wheels
SIZE: 7 x ½ x ¼ Type 1 2.50 KY 6
At A PROPELLER DIVISION
Made By

Field Test Report on Grinding Wheels
SIZE: 1.46 NY6 10 x ⅜ x ¾ Type 1
At DRILL & TOOL COMPANY
By

Field Test Report on Grinding Wheels
SIZE: 2.46 JY6 6 x ½ x 1¼
At GEAR GRINDING COMPANY
Made By

Field Test Report on Grinding Wheels
SIZE: 14 x 3 x 1¼ 3.20 JC 5
At A FOUNDRY
Made By

Field Test Report on Grinding Wheels
SIZE: 2.46 LYR 6 7 x ½ x 1¼
At GAUGE COMPANY
Made By

Every MID-WEST item, whether a sandpaper, a grinding wheel, a hone, a rubbing brick, a sharpening stone, compound or wheel dresser, stands on its own record in a family of dependable service-rendering products.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso Mich. — 1960 E. Milwaukee Ave. • Detroit 11, Michigan — Rochester Pa.

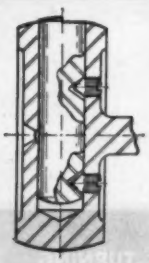
STANDARD

TeBo Gages

NOW produced in America for American Industry

ONE OPERATION
Checks Minimum and Maximum Tolerances

REVEALS BORE CONDITION AT ANY POINT



ADJUSTABLE FOR CHANGE OF TOLERANCES

Check Bores in ONE Operation More Accurately, 60% Faster Than Conventional Type Plug Gages

TeBo GAGES, long the favorite bore checking instruments of Swedish and other European precision workers, are now produced by Standard Gage Company. Considered by users the most desirable fixed limit type gage, TeBo can make a tremendous contribution to precision in American mass production. It performs, in one operation, the several functions required of plug gages, with an ease and accuracy that is a revelation to expert craftsmen.

With TeBo Gages, both minimum and maximum limits may be checked in one operation. They reveal the internal conditions of the bore at any point, indicating such factors as out-of-round, taper, belling, as well as dimensional deviations. They can be used with equal accuracy in soft as well as hard metals. May be used in thin walled bores without risk of distortion.

The chromium plated TeBo Gage head is a section of a true sphere, the ideal shape for internal gaging. It passes through a bore freely, without jamming or forcing. A spherical projection controls maximum tolerance measurements. Standard Gage has added adjustability to this projection by means of two ingenious set screws.

TeBo Gages are light in weight and precisely balanced. They minimize fatigue and may be used over long periods without strain. Their operation is so simple and direct and their findings so easily understood that major gaging operations may be entrusted to workers of slight technical skill. Users report savings up to 60% in gaging time through use of TeBo Gages.

WRITE FOR NEW TeBo GAGE BOOKLET

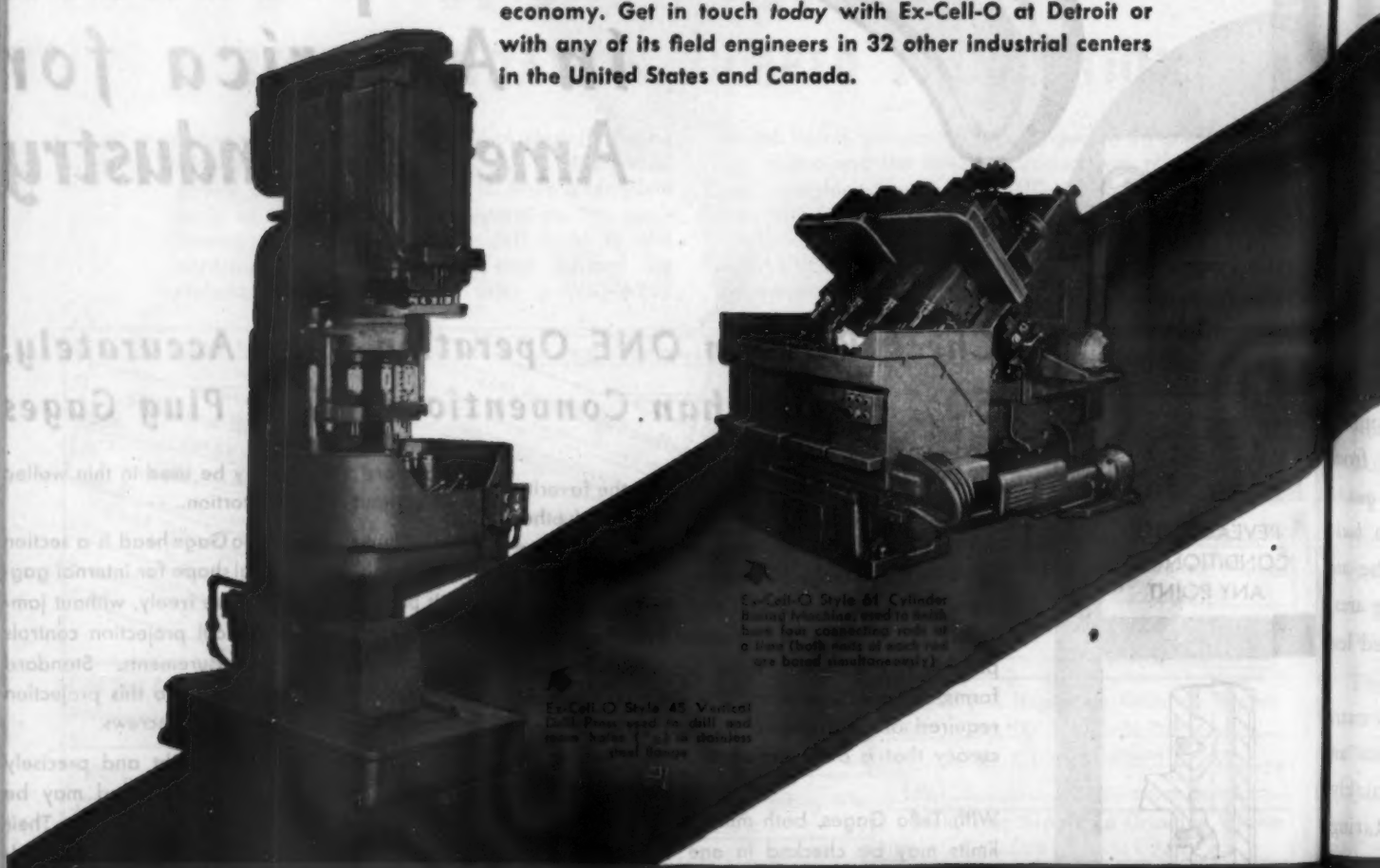
TeBo Gages Patented in U. S. and Foreign Countries. Other Patents Pending.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

. . . . . *it is later*

Plan *Now* to EX-CELL-O*ize*

NOW is the time to prepare for needs immediately ahead . . . for tomorrow's keener competition that will make more efficient production methods essential. Your production problems may readily be solved by special-purpose machines that perform multiple operations . . . machines designed and built to meet your specific requirements. Ex-Cell-O has many years of practical experience in *precision engineering* special-purpose machines that combine improved accuracy and finish with greater production and worthwhile economy. Get in touch *today* with Ex-Cell-O at Detroit or with any of its field engineers in 32 other industrial centers in the United States and Canada.



Ex-Cell-O Style 61 Cylinder Boring Machines used to finish bore two connecting rods at a time (both ends of each rod are bored simultaneously)

Ex-Cell-O Style 45 Vertical Drill Press used to drill and spot bores [illegible] in stainless steel flange

Where increased production, high accuracy, and greater economy through multiple operations are required . . . consult EX-CELL-O.

EX-CELL-O *makes:*

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES

SPECIAL MULTIPLE PRECISION DRILLING MACHINES

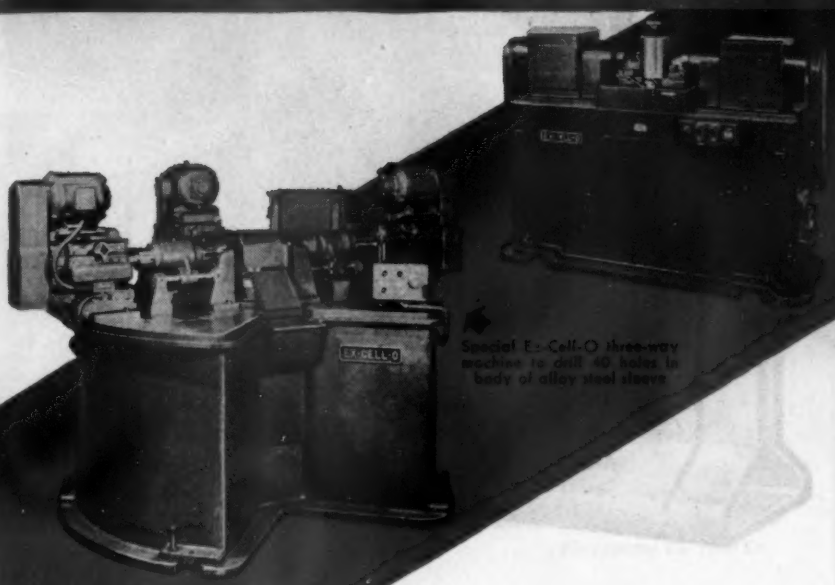
PRECISION BORING, TURNING AND FACING MACHINES, AND FIXTURES

PRECISION CYLINDER BORING MACHINES

PRECISION THREAD GRINDING MACHINES

than you think!

for Tomorrow's Production Needs



Special Ex-Cell-O three-way machine to drill 40 holes in body of alloy steel sleeve

Special Ex-Cell-O Machine to mill four grooves in sleeve-type alloy piston

PART: *Aircraft motor accessories drive housing*

MATERIAL: *Magnesium*

OPERATION: *Finish bore and face five periphery holes*

MACHINE: *Ex-Cell-O No. 61 Cylinder Boring Machine*

One Ex-Cell-O machine now does the work on this part where before four other machines were required. The saving in machines, fixtures, operators and floor space is readily apparent.

EX-CELL-O CORPORATION • DETROIT 6

1919 — TWENTY FIVE YEARS OF SERVICE — 1944

XLO

EX-CELL-O *for* PRECISION

PRECISION LAPPING MACHINES
PRECISION BROACH SHARPENING MACHINES
OTHER SPECIAL PURPOSE MACHINES
BROACHES AND BROACH FIXTURES

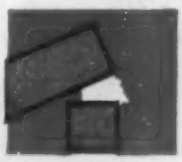
HYDRAULIC POWER UNITS
GRINDING SPINDLES
DRILL JIG BUSHINGS
CONTINENTAL CUTTING TOOLS
TOOL GRINDERS
FUEL INJECTION EQUIPMENT

R. R. PINS AND BUSHINGS
PURE-PAK PAPER MILK BOTTLE MACHINES
PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

arcs leave this point Fast!

A POINT TO REMEMBER!

LIKE THIS. Diamond-pointed break jaws confine arcing to the point . . . force the arc to break outside the current carrying area. Contact surfaces stay clean . . . don't pit, don't burn.



NOT LIKE THIS. When ordinary safety switches are opened, the arc leaps across the contact areas . . . along the jaws and blade. It hangs on longer, burns and pits the contact surfaces.

When arcs hang fire, switch contacts become pitted and burnt . . . cause trouble. To avoid this, keep the arc away from the contact area—*and* put it out *quick!*

Westinghouse Safety Switches do *both*. The diamond-pointed jaw forces the arc to break outside the current-carrying area. Contacts stay clean, last longer, need less care, provide better protection.

For 575 or 600-volt circuits, Westinghouse provides extra protection—the exclusive "De-ion" arc quencher. Arcs are drawn into the grid chamber—divided—quenched quickly!

Protect circuits with Westinghouse Safety Switches. Ratings up to 1200 amps, 600 volts. Call your Westinghouse Representative today. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Dept. 7-N.

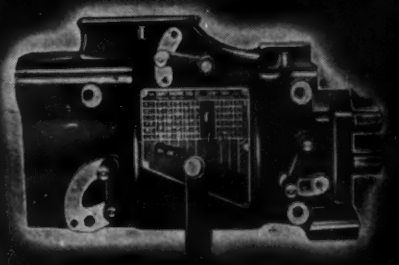
J-21299

Westinghouse SAFETY SWITCHES

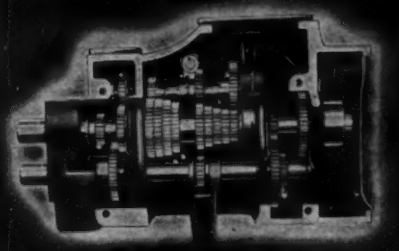
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Sidney

40TH ANNIVERSARY

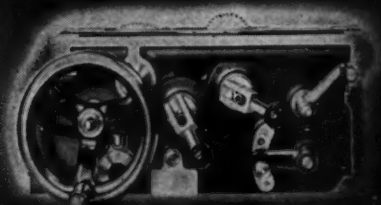


FRONT VIEW OF GEAR BOX

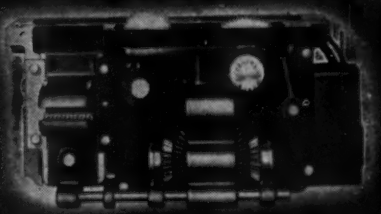


REAR VIEW OF GEAR BOX

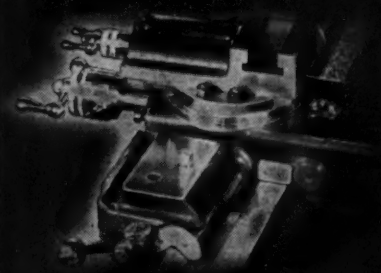
Photo courtesy The Yoder Co.



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON



SIDNEY COMPOUND REST

For all around utility

SIDNEY LATHES

● This battery of Sidney Lathes at a prominent midwestern plant shows how these rigid machines are being used in hundreds of plants to meet precision demands on an exceptionally wide range of work.

Sidney Lathe construction is particularly rigid. For example the bed differs from conventional design in that it has four walls with cross girts spaced at 12 inch intervals. This construction resists deflections and twisting strains and eliminates vibration.

Thus in this and many other ways Sidney Lathes assure strength—smooth flowing power—high productivity on a vast number of turning jobs of all kinds.

Bulletins on all sizes available.

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

ARMSTRONG

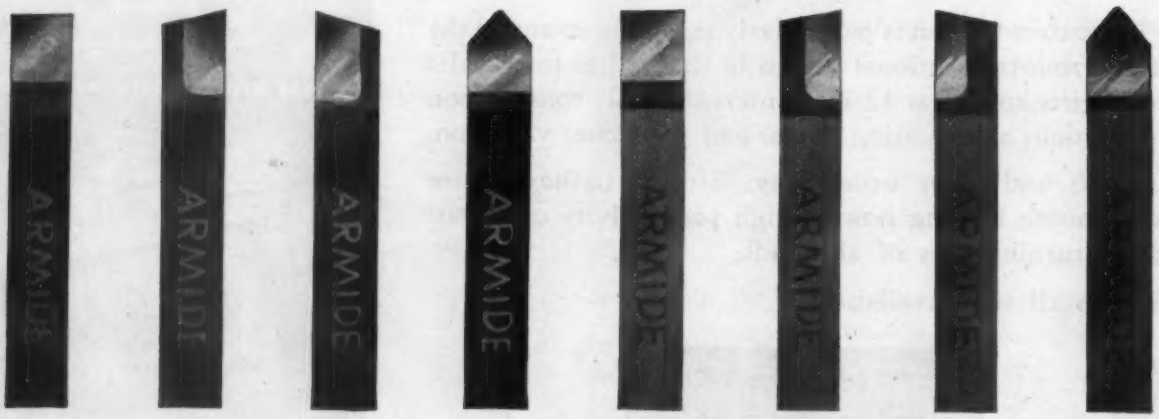
THE "ARMSTRONG SYSTEM" PROVIDES CARBIDE CUTTING TOOLS FOR EVERYDAY OPERATIONS

The wide use of carbide-tipped cutting tools for greater war production has changed standard cutting speeds and feeds. Carbide tools cut the hardest and toughest steels, sand-filled castings and many heretofore unmachineable substances without appreciable loss of edge . . . lengthen the interval between tool regrinding from 10 to 100 times on long runs.

The "Armstrong System" provides the "carbide" tools for everyday operations in tool rooms and machine shops: standard ARMSTRONG *Carbide* TOOL HOLDERS and ARMIDE Carbide-Tipped Cutters, ground to standard cutting shapes, for use in these tool holders.

ARMSTRONG *Carbide* TOOL HOLDERS come with "Straight", "Right-Hand Off-Set" or "Left-Hand Off-Set" shanks, each in 7 sizes. ARMIDE Carbide-Tipped Cutters come in two grades: ARMIDE Red for cutting steel; ARMIDE Gray for machining cast iron, brass, bronze, aluminum and non-metallics. ARMIDE cutters are ready ground in the four shapes illustrated.

ARMSTRONG *Carbide* TOOL HOLDERS and ARMIDE Cutters are stocked by industrial suppliers, and are sold singly or in matched sets in a fitted steel case.



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. **CHICAGO 12, U. S. A**

Eastern Whse. and Sales: 199 Lafayette St., N. Y. 12, N. Y.

Western Whse. and Sales: 1275 Mission St., San Francisco, Calif.

. . . help sustain high production, and precision

Kennametal centers outlast high speed steel centers 50 to 100 times, because the nib is made of special, very hard, non-galling grade of carbide. Increased production rates can thus be sustained—jobs keep turning on Kennametal centers, while steel centers are being removed for grinding many times—40, 50, or even 100.

Chatter due to center wear is eliminated and accurate machining thereby maintained. Costs are reduced—fewer centers need to be reground—less idle time of machine and operator for replacements.

The unique ability of Kennametal centers to keep work running true makes them well suited for precision jobs on grinders, and, when teamed with Kennametal lathe tools, they help to assure such accurate turning that grinding operations can often be eliminated.

Kennametal centers are stocked in standard sizes—Morse, Brown & Sharpe, and Jarno tapers. Separate, accurately molded nibs are available for those who wish to make their own centers. Catalog 44 describes them. A copy is yours for the asking.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

"Put it on the Blanchard"

Get These Advantages

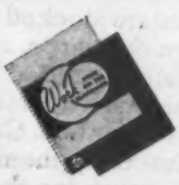
- Production ✓
- Adaptability
- Fixture Saving
- Operation Saving
- Material Saving
- Fine Finish
- Flatness
- Close Limits ✓

.50 cal. Bolts on No. 18 – 30" Chuck

These bolts are held in fixtures, locating from hole in bolt, for grinding two sides square. The opposite sides are then ground, holding the bolts directly on the magnetic chuck.

The material is alloy steel measuring 9⅝" x 2⅛" x 2⅛". .007" of stock is removed from each side to limits of ± .00075". 50 surfaces are ground per hour.

Surfaces that are accurately square and parallel are economically produced by Blanchard Grinding. Later operations can be done better and quicker because of having these surfaces for locating and holding.



Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

This job being done on the No. 18 Blanchard Surface Grinder

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

HERO ★★★

Soon he'll be home from the wars—triumphantly home . . . to what?

The cold facts are these:

Nearly one-third of our fighting men are returning to "homes" that are without running water . . . 35 per cent of the dwelling units in this country are without sanitary plumbing or bathing facilities of any kind . . . and American slums have bred the highest rate of juvenile crime in our history.

In short, there's still a war to be won here at home!

Our weapons are the mightiest on earth. Our manufacturing productivity is equal to half the world's total capacity . . . our basic economy and our currency are sound . . . and our faith in the American Ideal is stronger than ever before.

The time to start fighting that war is now. Delay could mean defeat, and the loss of all that our sons have fought and died for. Victory will mean a great new age of peace and prosperity, with jobs and security for all.

The engineers of the basic machine tool producers can help the men of government and of industry to win that victory . . . to plan now the reconversion of our tremendous wealth of resources, skills and machinery to all-out production for a better America!

One of these engineers is a Bryant man. We urge you to call him in today.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

For turning jobs like this in quantity

THE RIGIDTURNER

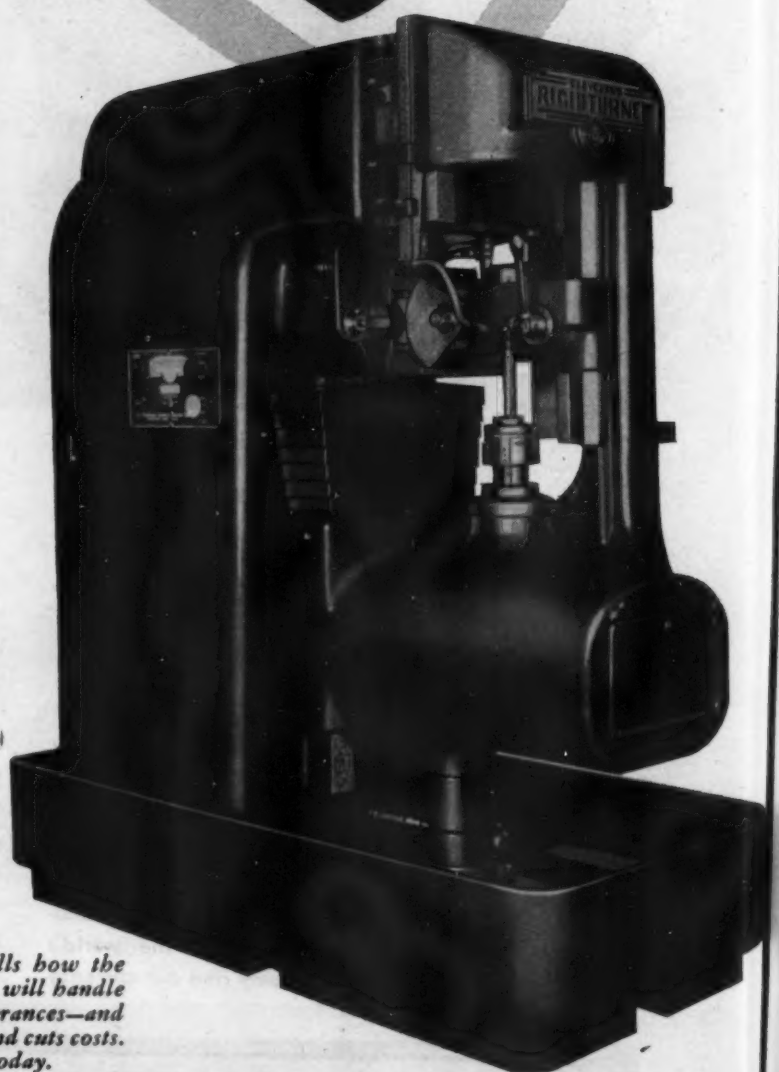
● On precision turning jobs, involving several diameters, where the duplicate production runs into large quantities, many concerns have found that they can maintain tolerances and faithful duplication at considerably lower costs with the Rigidturner.

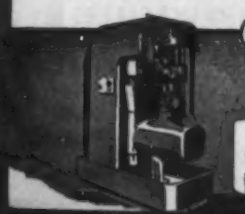
The rigid support to both the cutter and the work and the "O" construction assures freedom from twist and dependable, accurate duplication of all diameters.

The operation is simple—the operator merely loads and unloads the machine and presses a button. The machine operates automatically.

To obtain the various diameters a specially designed cutter is used and the work advances by this cutter which is rotated in variable timed relation producing the various diameters.

This Rigidturner booklet tells how the machine works—what jobs it will handle —how it maintains close tolerances—and how it increases production and cuts costs. Write for your copy today.





The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

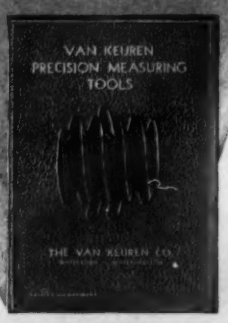
THREAD MEASURING WIRES

STANDARD EQUIPMENT EVERYWHERE

Van Keuren measuring wires are the accepted standard equipment for making measurements on thread gages, taps, worms, splines and spur gears. We carry a complete stock of sizes for measuring U. S. Standard, Whitworth, Metric, British Association, Pipe, Acme and 29° Worm threads. Special wires of any diameter in the range from .002" to 1.5708" are made to order. Our large supply of blanks insures prompt delivery.

Van Keuren thread measuring wires are manufactured to National Bureau of Standards specifications. They are hardened, ground and lapped by precision methods developed over a quarter-century. They are accurate within .00002" for roundness and straightness and within ±.000025" for size. Special sizes are made to any tolerance required.

It is easy to use Van Keuren wires. The Van Keuren handbook, — "Precision Measuring Tools" gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable 144-page handbook No. 32.



THE Van Keuren CO., 178 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Sine Triangles.

Grinding Cracks AND BURNS CAN BE *Eliminated!*

Overcome these and many other common grinding troubles with the revolutionary—

QUAKER MICROGRIND PROCESS

60% REJECTS due to grinding cracks, taper and out-of-round condition . . . that was the best a large manufacturer of precision apparatus was able to obtain after 25 years of making the same part—a small ball bearing race. Both a grinding and a lapping operation were needed to secure the required finish.

Application of the Quaker MICROGRIND PROCESS not only eliminated these troubles but also produced—in a single grinding operation—the finest finish ever obtained on the part!

Equally sensational results are being obtained every day by the application of this revolutionary grinding method.

A Quaker Process Engineer will welcome the opportunity to explain—and prove to you *at our expense*—how the Quaker MICROGRIND PROCESS makes it possible to—

- **Eliminate grinding cracks.**
- **Prevent burns and distortion due to grinding.**
- **Greatly increase number of pieces ground per wheel dressing.**
- **Lengthen wheel life as much as 300%.**
- **Produce much finer, truly ground finishes.**
- **Virtually eliminate rejects.**
- **Greatly increase grinding production.**
- **Cut power consumption of grinders approximately 50%.**

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name ..... Position .....

. . . PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW . . .

Better LUBRICATION MEANS *Better Maintenance*

• Excessive wear and difficult maintenance often result from inadequate lubrication.

Sinclair provides a range of specialized oils and greases for *better lubrication* of *MACHINING EQUIPMENT*. These lubricants together with Sinclair Cutting Oils and Coolants satisfy shop requirements for low equipment maintenance costs and high speed precision output of machined products.

• •

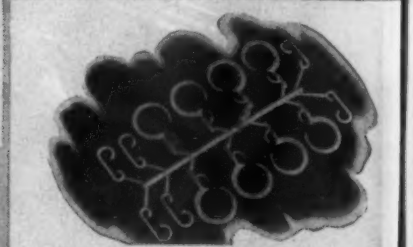
(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

SINCLAIR INDUSTRIAL OILS

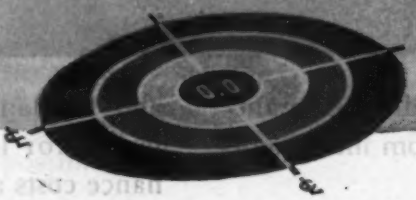
FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Could you Mill this 14 Cavity Mold complete in 52 Hours?

Close-up view of cavities in the solid mold block.



Plastic shower-curtain hooks in multiple, as they come from the mold.



Photos — Courtesy The Kampa Manufacturing Co. 1000-P

This 14-cavity plastic mold is a "sticker" if you try to produce it by ordinary methods — but read this report of its production with the Milwaukee Rotary Head Milling Machine!

The Milwaukee Rotary Head method made it possible to set up both halves of this shower curtain hook mold on the machine table. One cavity of each shape was then laid out by means of a scriber held in the machine spindle. Each milling operation was first performed on the location of the layout and then repeated for each additional cavity. Uniform and unvarying precision is repeated by this multiple origination of cavities with the Rotary Head Method. Total milling time complete — 52 hours.

Write for Bulletin 1002-C for full information on this unusual machine tool and the Rotary Head method of milling.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE

Kearney & Trecker

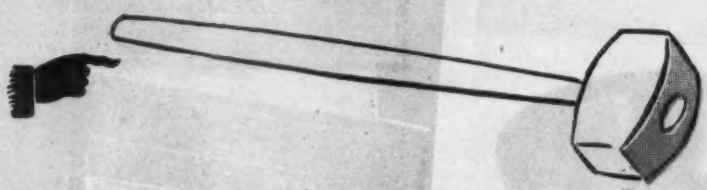
Products

CORPORATION

Milwaukee 14, Wisconsin

Subsidiary of Kearney & Trecker Corporation

It doesn't take this



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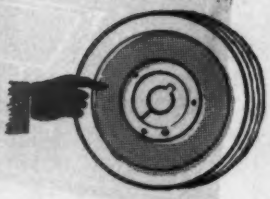
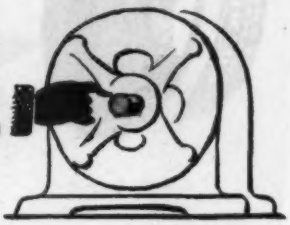
this  off this 

Allis-Chalmers' new "Magic-Grip" — *fastest mounting and demounting sheave on the market* — is removed from shaft in just 3 easy steps . . . saving you time, trouble, money.

1 Remove three capscrews from bushing collar. A handy wrench — supplied with each sheave — is the only tool needed to remove Allis-Chalmers' new "Magic-Grip" from motor or machine shaft quickly and easily.

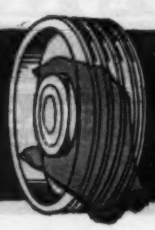
2 Insert two capscrews in tapped holes. As screws are turned, they become levers . . . automatically breaking tight grip of tapered split bushing on sheave and shaft. Entire unit is then ready for removal.

3 Remove sheave from shaft. Requires no mallet, no prying, no bulging muscles. You just slide the sheave off . . . smoothly, quickly. *It costs nothing extra!* Send for B6310. Allis-Chalmers, Milwaukee 1, Wis.

A 1758

Allis-Chalmers Texrope

"MAGIC-GRIP"



SHEAVES

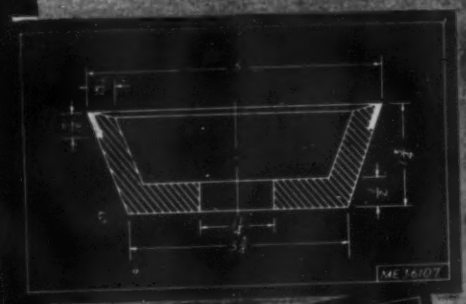
Better Performance! Lower Costs!

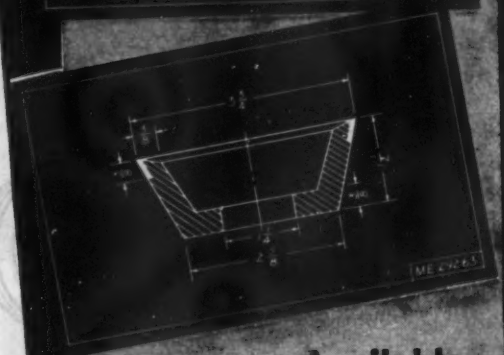
. . . With This Improved Design of NORTON DIAMOND WHEEL for Carbide Cutter Grinding

This new shape of flaring cup wheel is proving outstandingly popular for sharpening carbide tipped face mills and other multi-point cutting tools. The relatively narrow rim (1/16 or ⅛", depending on depth of diamond) gives it a cool, rapid cutting action and permits grinding in corners.

NORTON COMPANY, WORCESTER 6, MASS.

NORTON ABRASIVES





Available in Two Sizes

Economical

By backing off the inside of the rim up to the diamond insert as it wears down in use, the diamond section can be used up entirely. In effect it amounts to ⅜" depth of diamond in the case of the 3¼" wheel and 7/16" in the case of the 5" wheel.

Different Grades

Because these wheels are made in several grades of hardness they can be closely fitted to the job requirements.

Grit Sizes

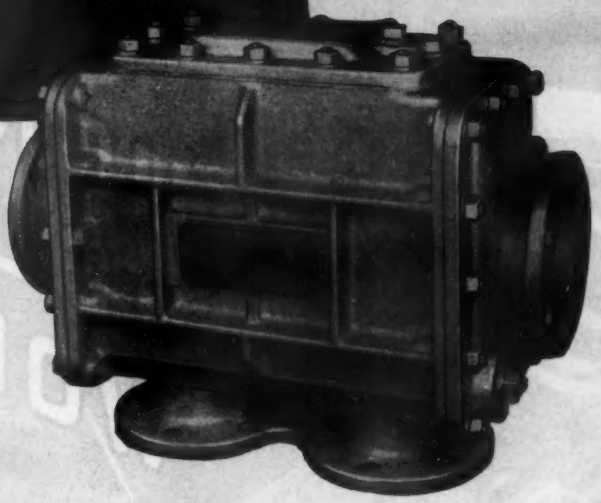
In a single grit size for both roughing and finishing 150 grit is recommended—or 120 grit if a slightly faster cutting action is desired.

The two wheel set-up, 100 grit for roughing and 400 grit for fine finishing, is becoming increasingly popular.

A New Motion Picture on Carbide Grinding

A thirty minute color film with sound. Loaned free. Write for information.

HARRISON
OIL COOLERS



KEEP LUBE OIL COOL—
and prevent excessive wear

Oil that's too hot can't be expected to provide adequate lubrication.

Properly cooled, however, it prevents excessive wear on bearings and other critical parts. Time-consuming shutdowns and costly repairs are greatly reduced.

Harrison Oil Coolers are efficiently designed to hold temperatures in the range required for proper lubrication. They are proving their worth on many different types of installations.

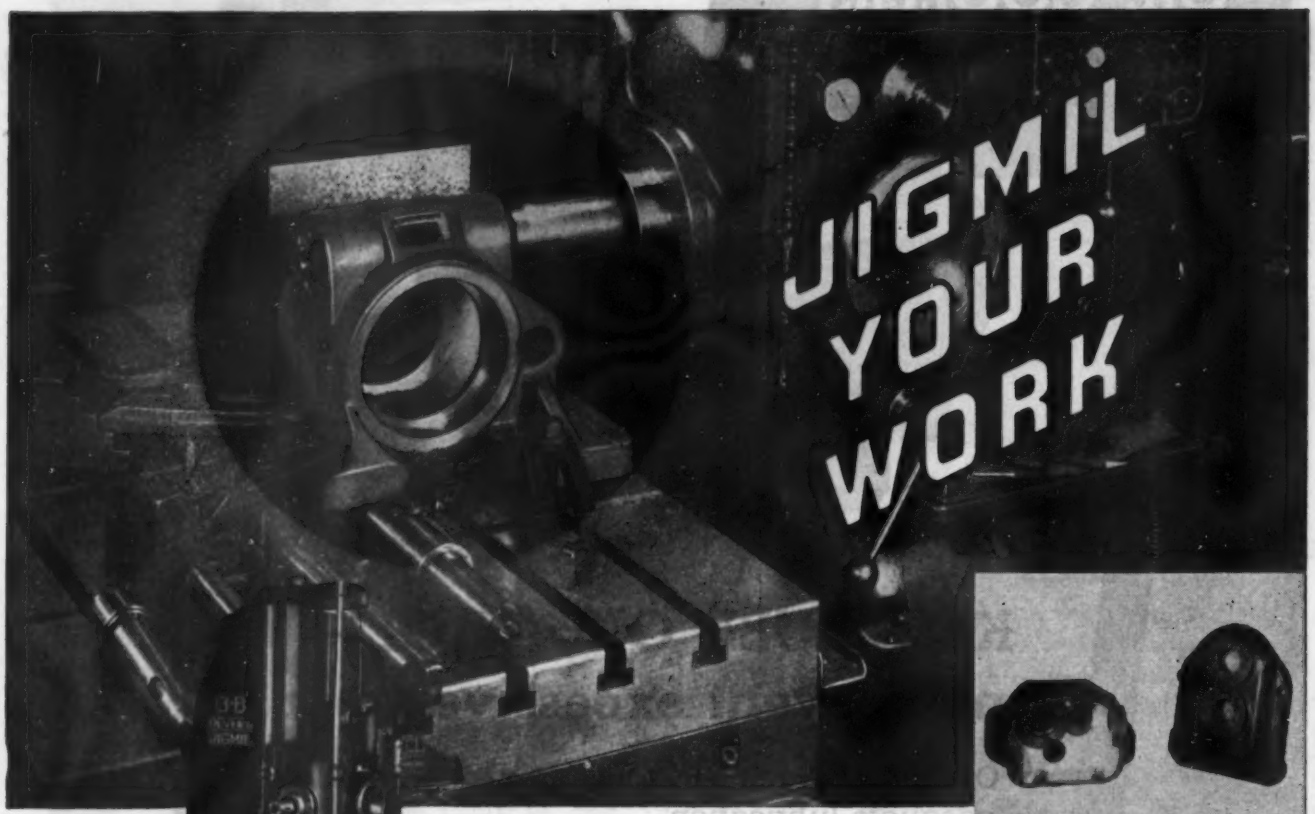
Write for recommendations regarding the correct cooler for your particular requirements.

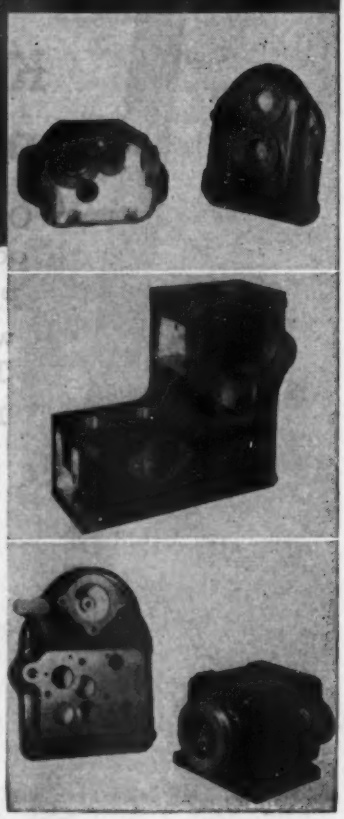
Keep On Buying WAR BONDS

HARRISON

HARRISON RADIATOR DIVISION OF GENERAL MOTORS, LOCKPORT, NEW YORK

JIGMIL for Faster, Better and more Accurate BORING and Milling Performance





The JIGMIL is a totally new approach to the problems of boring and milling having dependable accuracy and ease of manipulation that eliminates the necessity for specialized skill.

The JIGMIL provides great economies on experimental and tool work.

The JIGMIL does most production boring and milling work faster and more accurately with rugged tools working in the open than is possible with the part trapped inside the walls of a boring fixture.

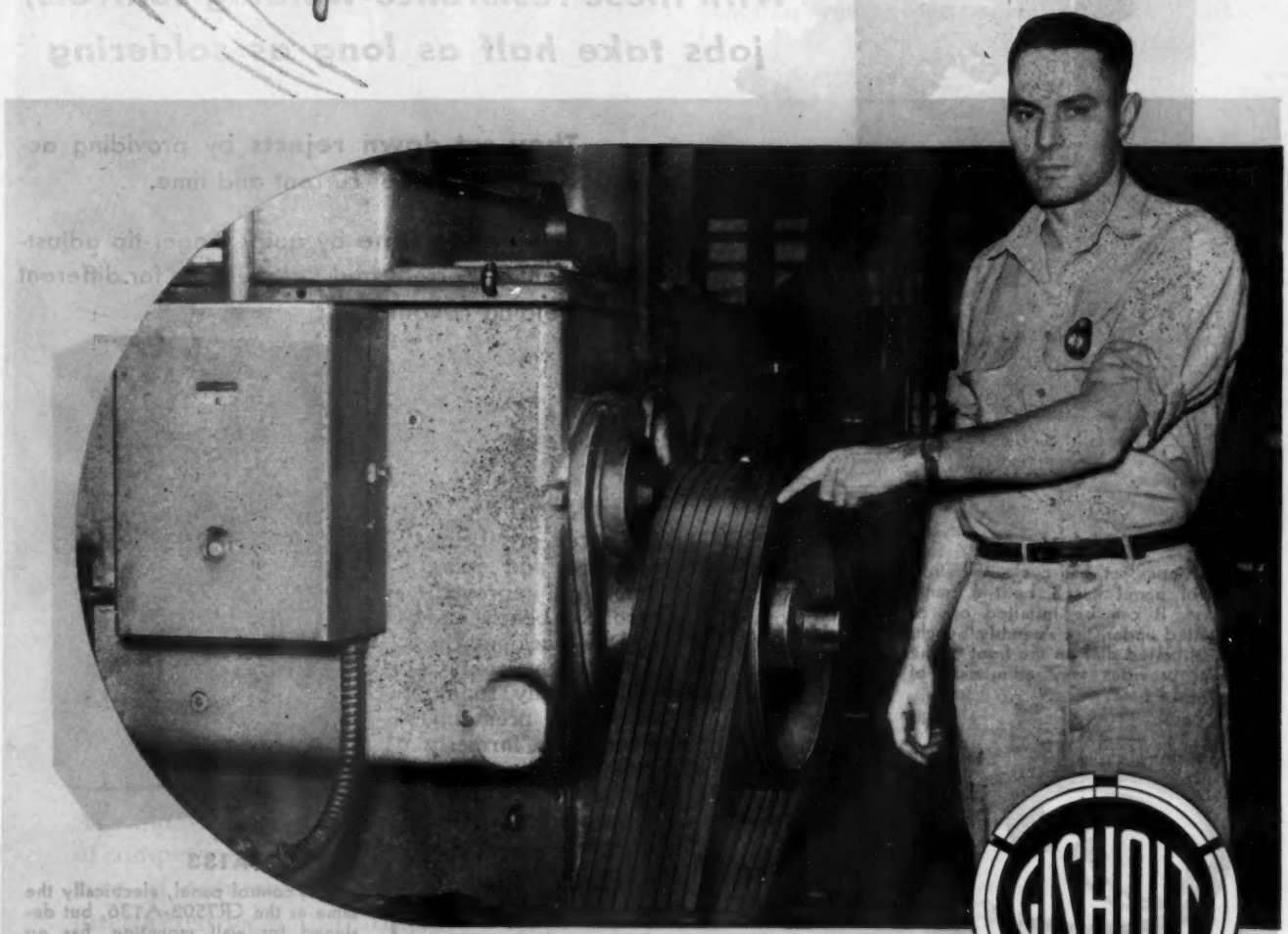
ARMY E NAVY

Two to three times faster than any other method.

Dependable accuracy and better finished holes than any other method.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

Don't slip on this one!

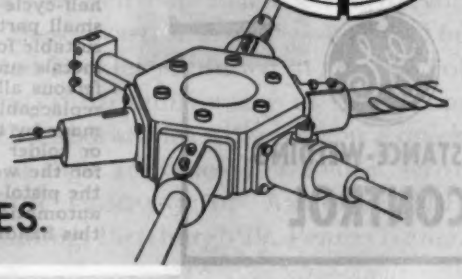


KEEP ALL VEE-BELTS AT PROPER TENSION

Slipping belts cause loss of power, excess heat and rapid belt wear.

There is no excuse for this waste with the easy belt adjustment provided by GISHOLT TURRET LATHES.

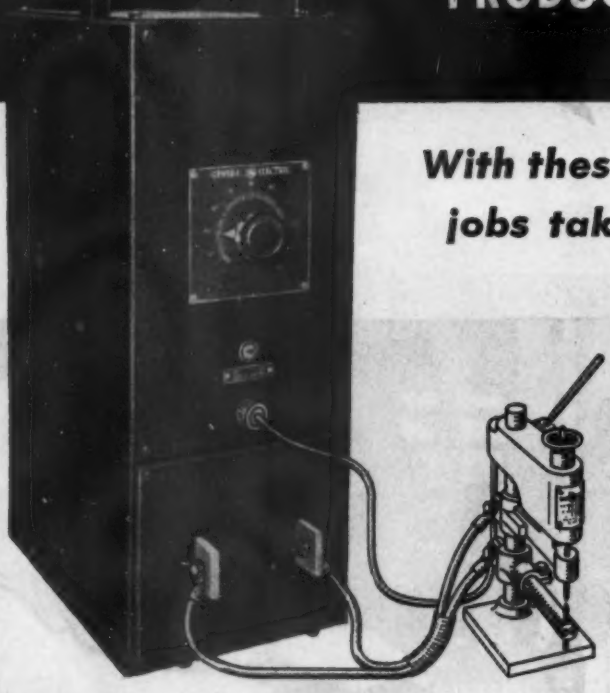
GISHOLT



★ *Reproductions of this page on enameled paper are available for use in your turret lathe department. Write the Gisholt Machine Company, 1201 East Washington Avenue, Madison 3, Wisconsin. Ask for the series of "Wartime Care and Operation" posters. State quantity desired.*

SAVE TIN

AND SPEED UP PRODUCTION OF SMALL PARTS



With these resistance-welding controls, jobs take half as long as soldering

They cut down rejects by providing accurate control of current and time.

They save time by quick, finger-tip adjustment of current and time settings for different welding conditions.

CR7503-A136

This compact, half-cycle, thyratron control panel has a built-in transformer. It can be installed on, or mounted under, the assembly bench. A calibrated dial on the front of the panel provides easy adjustment of the weld time.

PRODUCTION rates are being stepped up more and more through the use of new and improved, electronically controlled, bench and tong welders. With these welders, the jobs that were impossible yesterday, are done quickly and easily today. With tin and time at a premium, many manufacturers who formerly used soldering have now turned to resistance welding. Another big advantage of resistance welding is that properly welded joints will not come apart at high temperatures.

CR7503-A133

This control panel, electrically the same as the CR7503-A136, but designed for wall mounting, has no transformer with it. Useful where space is limited, as the control can be remotely located.

RESISTANCE-WELDING CONTROL

NEW TONGS FOR THESE CONTROLS

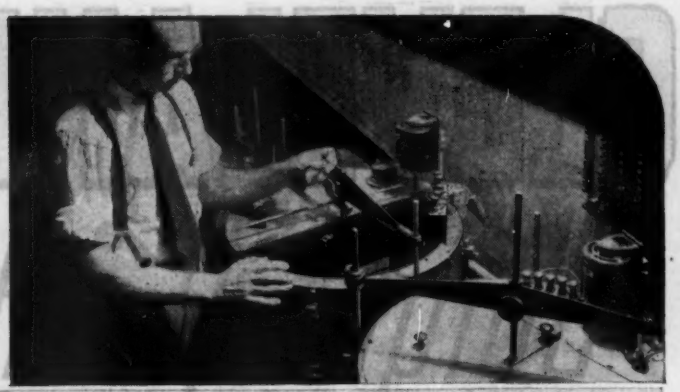
These tongs are used with either of the half-cycle controls described when welding small parts in a restricted space. Especially suitable for welding solid or stranded wire to metals such as copper, brass, bronze, steel, ferrous alloys, etc. Tongs are equipped with replaceable tips, and will take other tips made by the user for individual needs. Flux or solder is unnecessary, and the pressure for the weld can be accurately adjusted on the pistol-shaped handle. The weld is made automatically when pressure is exerted on this handle.

Do these controls "fill the bill"?

If you would like complete information on these controls and welding tongs, send today for bulletin (GEA-3045). If these controls aren't the answer to your problem, let us know. We have a complete line of electronic controls for resistance welding. *General Electric, Schenectady 5, N.Y.*

BUY WAR BONDS

GENERAL ELECTRIC



Alcoa's giant precision-testing and metal-working machine

Aluminum alloys being given a precipitation heat treatment in a constant temperature oil bath

ALUMINUM RESEARCH LABORATORIES

THESE *Ivy-Covered* WALLS ARE A SYMBOL

A foundation solid as only a quarter century of competent research can make it—a structure of accumulated scientific knowledge interpreted by mature thinking—chemists, metallurgists and engineers with the realistic urge that "aluminum must be made to work harder *today*"—the finest of modern equipment. This is Aluminum Research Laboratories.

This is the reason why, when the emergency of World War II threatened, research didn't have to be started. It had been under way here for years.

Light metal alloys had been invented to meet practical conditions. Methods of producing aluminum, of fabricating and assembling it, were developed. This information was disseminated among the companies from which today's miraculous applications of aluminum have sprung.

Alcoa research can mean a lot to you during these wartimes and postwar. The illustrated booklet published at the time of the twenty-fifth anniversary of Aluminum Research Laboratories will give you a quick picture of their activities. For a copy, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

CLEVELAND
Single Point
PRESSES

These two Cleveland Single Point Presses, which are designed with single connections located in the center of the slides, are typical of this Modern line, which also embraces Two Point Presses having two connections and Four Point Presses having four connections, each of which can be furnished in sizes and capacities to suit requirements. The design of these Modern Cleveland Presses not only contributes to greater rigidity and ruggedness but also to extreme accuracy in the production of duplicate parts as well as to a considerable saving in overall floor space. The 1-28-200 has a capacity of 200 tons. The 1-36-250 has a capacity of 250 tons.

Two Point
PRESSES HAVE A CONNECTION AT EACH SIDE OF THE SLIDE

Four Point
PRESSES HAVE A CONNECTION AT EACH CORNER OF THE SLIDE

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*

Which one are you?

Each of these men has a different lighting problem. Read how G-E lamps are helping him to solve it.

FACTORY MANAGER: "We've got to keep production rolling at top speed, on precision work as well as simple assembly jobs. With good lighting... from G-E Mazda lamps... eyes see quicker and hands move faster. That helps keep us right on schedule."

PURCHASING AGENT: "No time to take chances these days. To get the right lamps for the right job—every time—we go right to G-E. It pays big time-saving dividends and today that's more important than ever."

PRODUCT DESIGNER: "If you're stuck for new ways to add sales appeal... as we were... then consider all the possible uses for G-E Mazda Lamps as quick visual indicators. They may be the solution to help you make your products better, more dependable and easier to sell."

MAINTENANCE MAN: "No wonder we've cut down on maintenance time! General Electric lamps are just as near as the telephone. When we need lamps quick... in an emergency... G-E gets them here in a hurry."

PLANNING a postwar program? Want all the benefits of faster, easier seeing with soft, cool G-E fluorescent lighting? Or do you need special G-E lamps that will help do tough jobs better?

Then remember these two important facts:

1. Get the *right* lamp. Your G-E lamp supplier will be glad to help ... and he knows how to serve your needs best.

2. Be sure you specify G-E Mazda lamps. They give all the economy and efficiency developed by over 50 years of G-E leadership in lamp research. They're made to "stay brighter longer."

"TO MAKE G-E LAMPS STAY BRIGHTER LONGER"
The Constant Aim of G-E LAMP RESEARCH

G-E MAZDA LAMPS

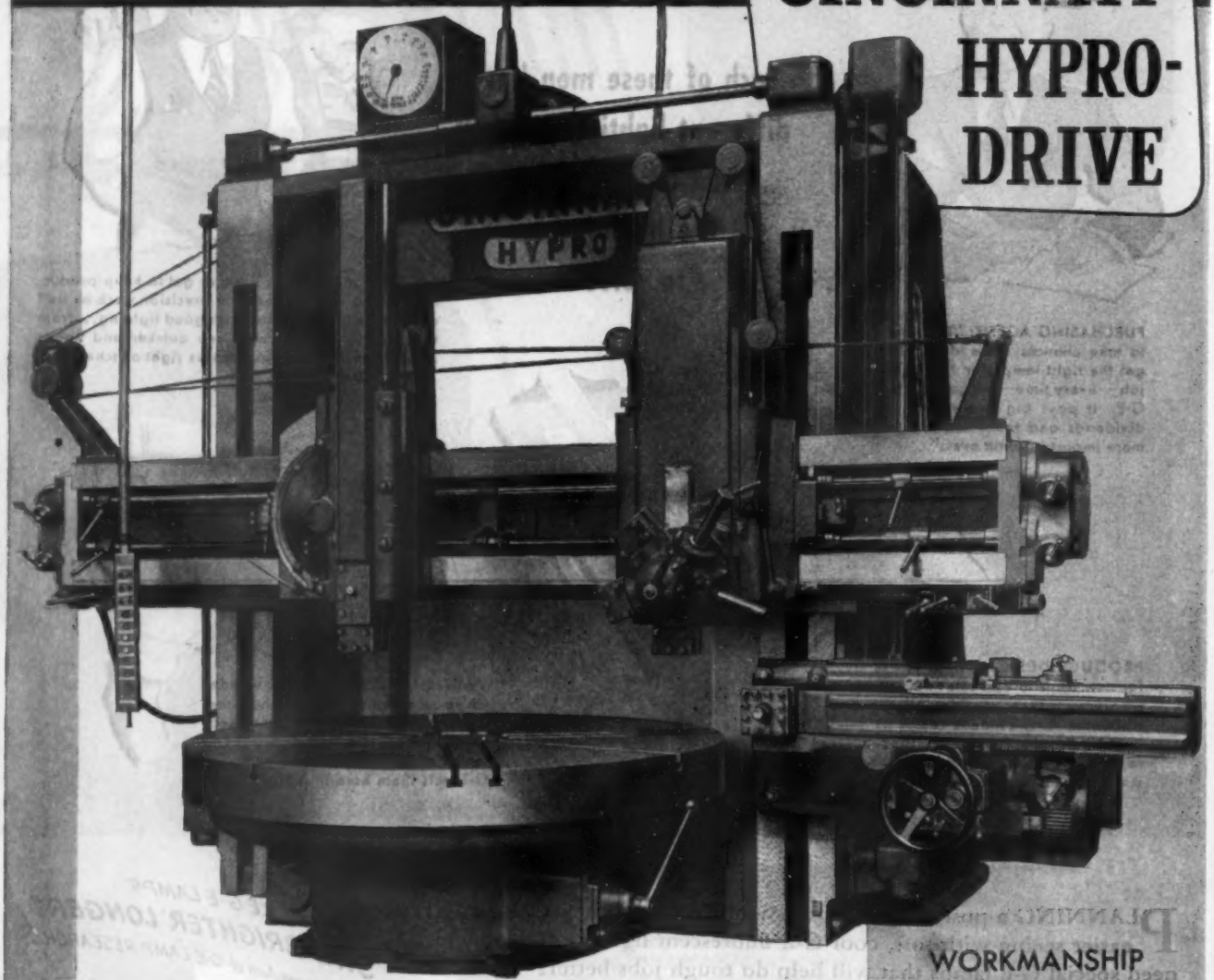
GENERAL ELECTRIC

KEEP BUYING WAR BONDS... KEEP THE WAR BONDS YOU BUY

Hear the G-E radio programs: "The All-Girl Orchestra," Sun. 10 p.m. EWT, NBC; "The World Today" news every weekday, 6:45 p.m. EWT, CBS.

PLAN NOW FOR *Hypro-duction*

Use the newly developed CINCINNATI HYPRO-DRIVE



New Cincinnati Hypro Boring Mill Drive makes available, for the first time on any general purpose boring mill, the following advantages:

Finger-tip Speed Adjustment—Complete range of speeds under cutting loads ordinarily encountered may be handled by pendant push button control, without gear changing.

Versatility—Extra heavy cutting loads or low speed cutting may be handled by back gear, operated by a single lever.

Fine Increment Speed Control—Multi-point, fine increment motor rheostat, controlled from operator's position, eliminates compromise speed settings inevitable with conventional gear change methods. Exact cutting speed insures maximum production.

Tailored Table Speeds—On work of varying diameter, table speed may be continuously adjusted for maximum production, without stopping table, without shifting gears, and while tools are cutting.

Setup Time Reduced—Fine table-inching control in both directions, with dynamic braking, speeds setup.

Fatigue Elimination—Complete control of all motors from single, accessible pendant station, plus absence of table clutch and brake shifting, lessens operator fatigue.

Visual Indication of Table Speed—Table speeds shown on large calibrated rheostat dial may be easily read from any working position by operator.

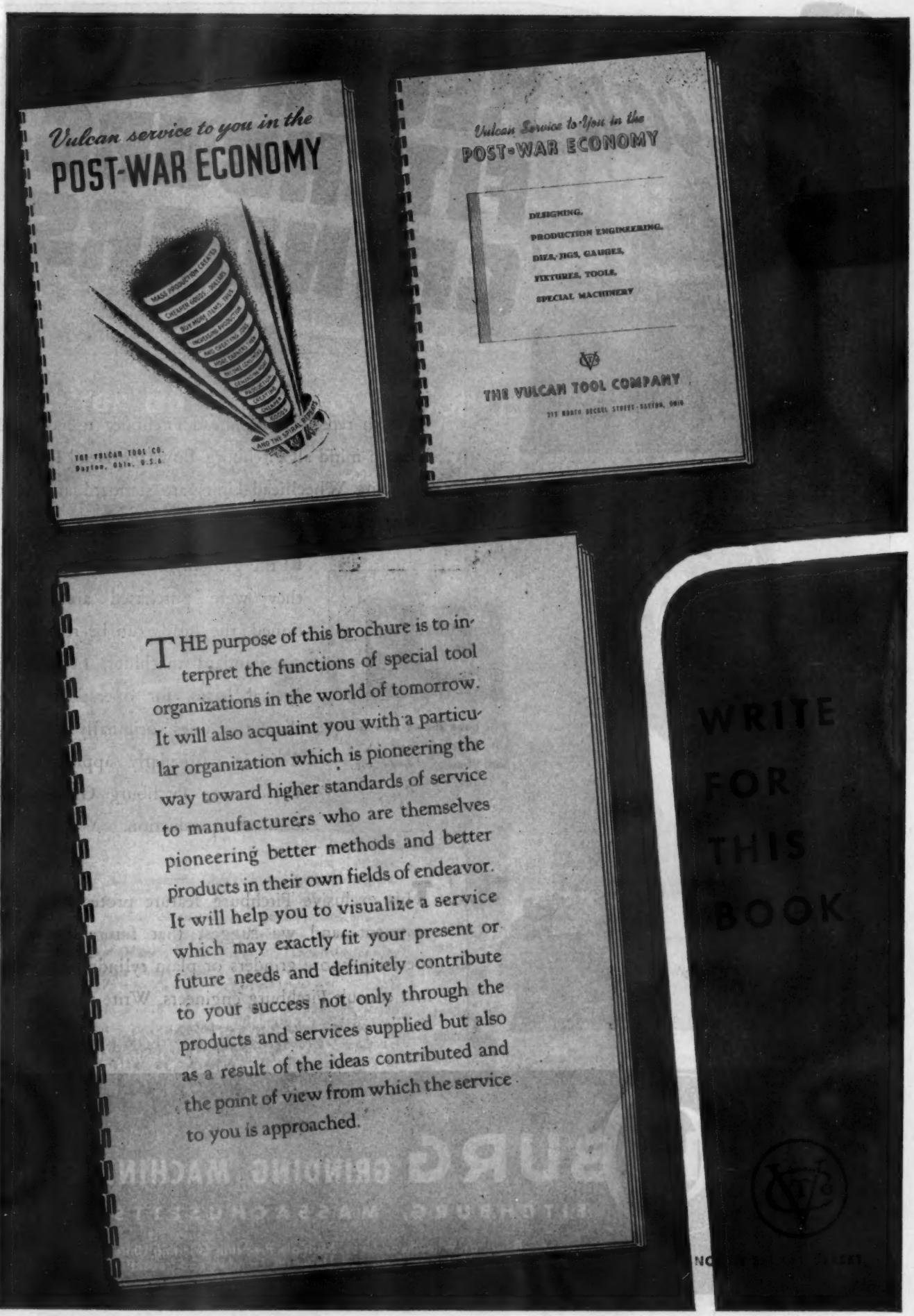
WORKMANSHIP
RIGIDITY
POWER
ACCURACY

ARMY E NAVY

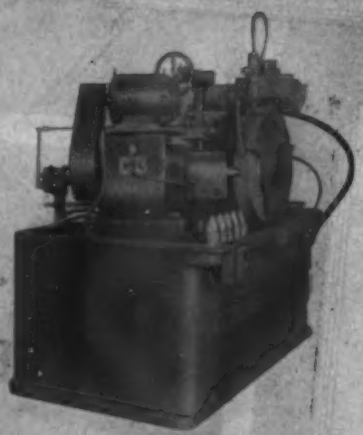
THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

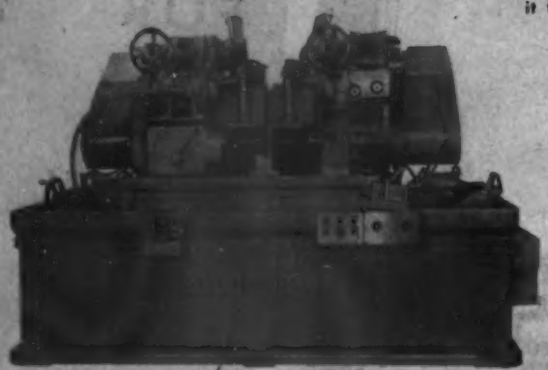
CINCINNATI . OHIO . U.S.A.


Vulcan service to you in the
POST-WAR ECONOMY
THE VULCAN TOOL CO.
Dayton, Ohio, U.S.A.
Vulcan Service to You in the
POST-WAR ECONOMY
DESIGNING,
PRODUCTION ENGINEERING,
DIES, JIGS, GAUGES,
FIXTURES, TOOLS,
SPECIAL MACHINERY
THE VULCAN TOOL COMPANY
THE purpose of this brochure is to interpret the functions of special tool organizations in the world of tomorrow. It will also acquaint you with a particular organization which is pioneering the way toward higher standards of service to manufacturers who are themselves pioneering better methods and better products in their own fields of endeavor. It will help you to visualize a service which may exactly fit your present or future needs and definitely contribute to your success not only through the products and services supplied but also as a result of the ideas contributed and the point of view from which the service to you is approached.
WRITE FOR THIS BOOK

You can RECONVERT FITCHBURG GRINDERS



This book shows how to cut grinding costs . . . Sent free . . . write for it today.



With reconversion ahead Fitchburg users should keep in mind all Fitchburg Bowgage Head Precision Grinding Wheelhead Units are standard and interchangeable.

If the grinding operations for which they were purchased are discontinued, the heads can be remounted on standard machines, or on new special bases, for operations other than the ones originally specified. This is particularly appreciated by those using Fitchburg Grinders for ordnance production.

This exclusive Fitchburg feature protects your investment, and we suggest that future buyers of special purpose grinders or plain cylindrical grinders first consult Fitchburg engineers. Write us today.

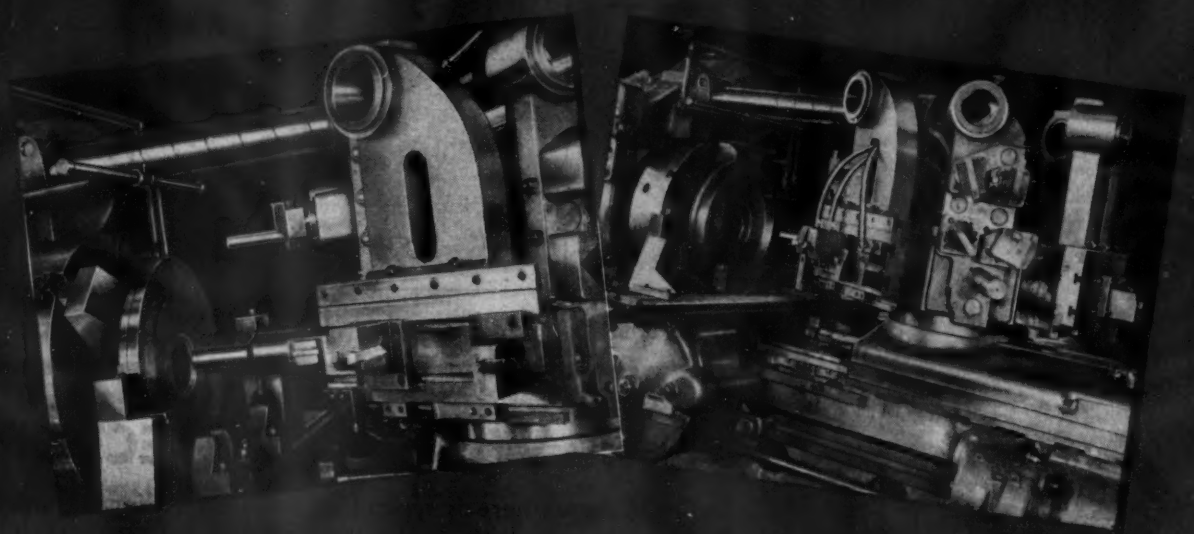
FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

P&J RETOOLING SIMPLIFIES RE-CONVERSION

after all—tomorrow's job may be different



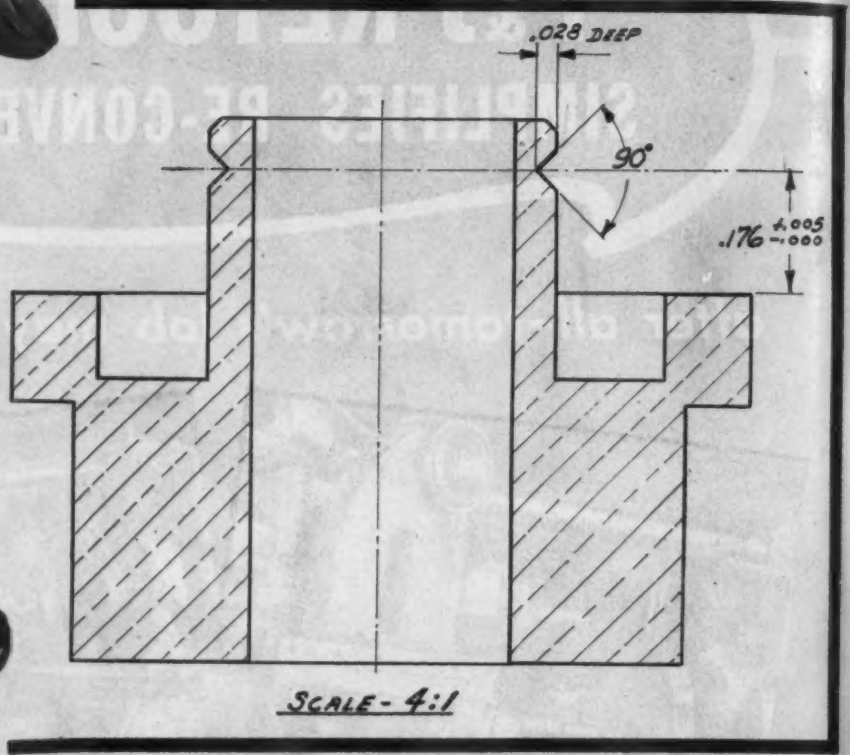
All P & J Automatic Chucking and Turning machines regardless of size or type—in addition their inherent features of convenience, power, speed and accuracy—have one important advantage in common—they are designed to facilitate RE-TOOLING for any work within their capacity.

The P & J 8 DXT Automatic on the job shown here has a tooling set-up specially developed for machining flywheels. It is typical of all P & J machines in that it can be converted to handle other work by re-tooling.

P & J machines in vast numbers have made many record-breaking contributions to war production. These same machines can play an important part in achieving low-cost civilian production. It is therefore important, when reconversion plans are being studied, that the practicability, economy and simplicity of re-tooling existing P & J machines be given careful consideration. Our engineers can be of valuable assistance in helping you work out those problems which will naturally be involved in production changeover.

REMEMBER—YOU GET MORE OUT OF BONDS THAN YOU PUT INTO THEM

This part is inspected in SECONDS . . .



Checking a circular form tool on the WILDER PROJECTOR.

on the WILDER PROJECTOR

The part shown here is typical of the wide variety of work that can be checked on the WILDER PROJECTOR. In this specific case, three dimensions including an angle can be inspected in one operation. The work piece is quickly located on a simple fixture and checked against a drawing. Errors, 12½ times magnified, show up on the screen in front of the operator.

The WILDER PROJECTOR has many applications in every machine shop and plant and is a great time-saver as an optical precision checker on work of all kinds.

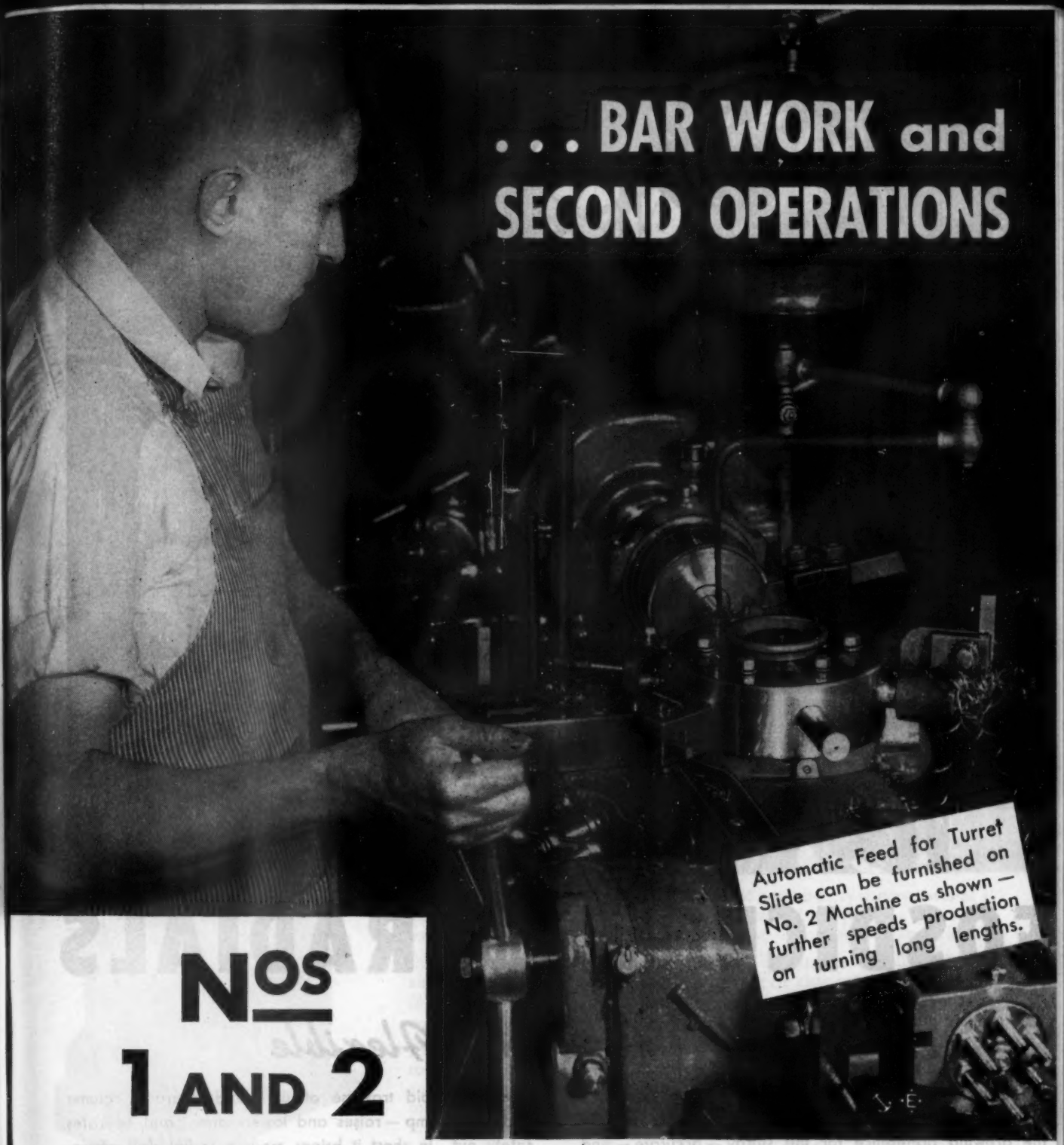
Ask to be placed on mailing list to receive "PRECISE PRODUCTION", a Scherr publication sent regularly to all those interested in modern inspection methods. Sent FREE and without obligation.

Advantages and Typical Applications in Inspection

1. It makes possible faster and more positive inspection by eliminating the uncertain human element of "feel."
2. It enables you to see exactly on a greatly enlarged image where tools, templates, gages, as well as parts in process vary from specified dimensions or contours.
3. And when you see exactly where and how much the errors are, it is easy to correct them, before they get into production.
4. It enables you to verify machine settings by quickly checking the first few parts, thus avoiding rejects.
5. It facilitates the control of tool wear through periodic inspection of parts in process
6. It is ideally suited for 100% inspection of the finished parts, where perfect interchangeability in assembly is required.

WRITE AT ONCE for NEW folder describing the uses of the WILDER PROJECTOR. You'll find several applications covered in this folder that suggest practical ways and means of reducing your measuring and inspecting time and eliminating complicated time-consuming methods.

GEORGE SCHERR COMPANY, INC. 200 LAFAYETTE ST., NEW YORK 12, N. Y.


. . . BAR WORK and
SECOND OPERATIONS
Automatic Feed for Turret Slide can be furnished on No. 2 Machine as shown — further speeds production on turning long lengths.

NOS 1 AND 2

WIRE FEED SCREW MACHINES

have ALL the features for PROFITABLE PRODUCTION

★ No. 1 Machine takes stock to ⅝" dia. (⅞" for light work).

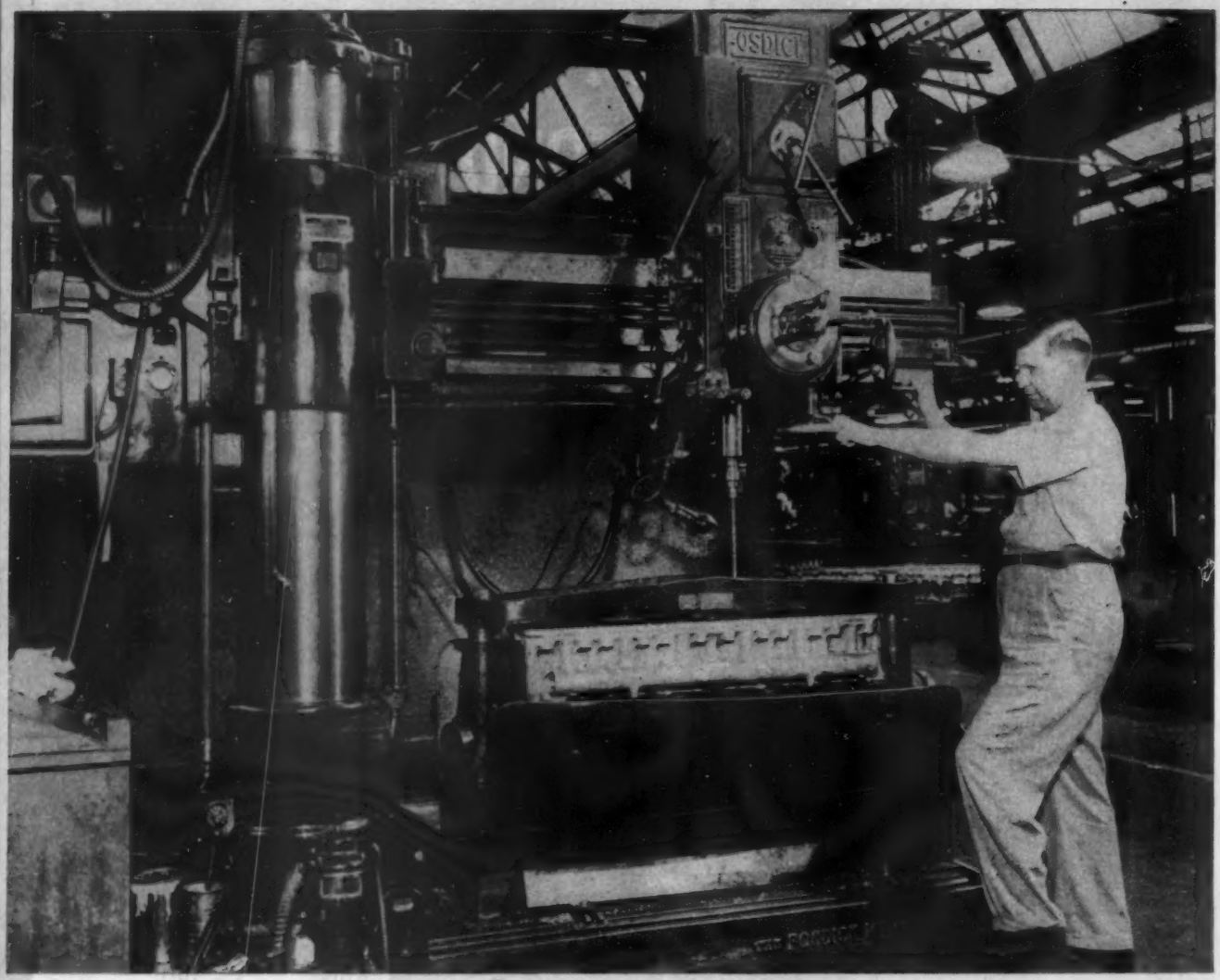
★ No. 2 Machine takes stock to 1" dia. (1¼" for light work).

Ask for Booklet giving details

B·S BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

— high productive capacity — unusually rapid set-up — simple to operate — stock fed in ¾ second — powered for heavy duty.

BROWN & SHARPE



FOSDICK Hydraulic RADIALS

Sturdy - Accurate - Flexible

● The increasing number of Fosdick Radials constantly going to industrial plants throughout the country indicate the growing preference for this sturdy — accurate — and flexible radial drill.

Illustrated is a Fosdick Radial drilling motor castings. Numerous holes of various diameters may be drilled at one setting on a job like this — easily — quickly — accurately.

The hydraulic function of the machine not only facilitates the controls but provides for rapid traverse of the head—operates column and arm clamp — raises and lowers arm — and operates safety nut. In short it brings modern radial drill operation plus lower drilling — reaming and boring costs to your shop.

For accuracy — high production — low costs put your next radial job on a Fosdick Hydraulic.

For complete, detailed information, write for the Fosdick Radial Drill Bulletin — R. A.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

NOW...

AUTOMATIC MACHINES CAN HAVE NOT ONE... NOT A FEW... BUT MANY CYCLES

Starting a new production era in which automatic control becomes as versatile as manual control

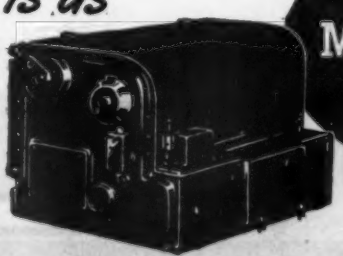
The Bullard "MAN-AU-TROL" principle of automaticity concentrates at a single "nerve center" the entire mental and muscular sequence a man must follow to run a machine... with repetitive accuracy no man can match.

In a Vertical Turret Lathe, for example, this means that it could turn out any part in the required quantity... and then be changed over quickly... *in a few hours, not days*... to produce any other part that manual operation could handle... over the entire range of that machine's possible functions.

In other words, the Bullard "MAN-AU-TROL", for the first time in machine-tool history, adds the high-speed, low-cost production of special-purpose automatic machines to the versatility of multi-purpose, manually operated machines. In addition, the machine can be shifted to manual operation by moving a single lever.

The Bullard Company, Bridgeport 2, Connecticut.

The automatic control that is as versatile as manual control



BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

100% automaticity... no human or cumulative error... control to closest tolerances —*a tremendous cost advantage in competitive markets!*

Universal Cutter and Tool Grinder No. 22 — Where precision, speed, flexibility and a wide range of operations count most, this machine is a star performer.

Hydraulic Feed (6" x 18") Surface Grinder No. 20 — Shown with vertical spindle for heavy stock removal. Also available with horizontal spindle and hand feed.

Universal Cutter and Tool Grinder No. 12 — Smaller than the No. 22 but the equal in its precisely engineered construction. Grinding a medium size face milling cutter with cup wheel, as above, is an example of the machine's versatility.

Six

FOR COVEL GRINDING MA

1. PRECISION BUILT
2. STURDILY CONSTRUCTED
3. ACCURATE PERFORMANCE
4.
5.
6.

See your nearest Covel dealer today. ...e and
Or write us for details on how to save ...vel pr

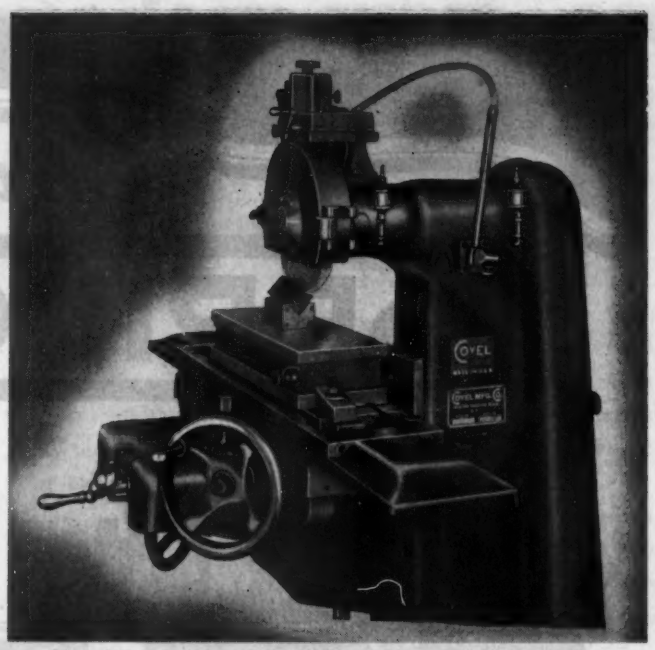
1874 to 1944

COVEL MACHINES REPRESENT ... YE

COVEL PRECISION

COVEL MFG. CO., BENTON

Hydraulic Surface (8" x 24") Grinder No. 5 — Built for precision yet designed for operator ease and accuracy, this grinder with three spindle speeds will give performance under strenuous demands.



Hand Feed (6" x 18") Surface Grinder No. 15 — For the short production runs and occasional tool room job where quick set-ups save time, this hand operated machine with three spindle speeds will add extra production hours each month.

ix Reasons

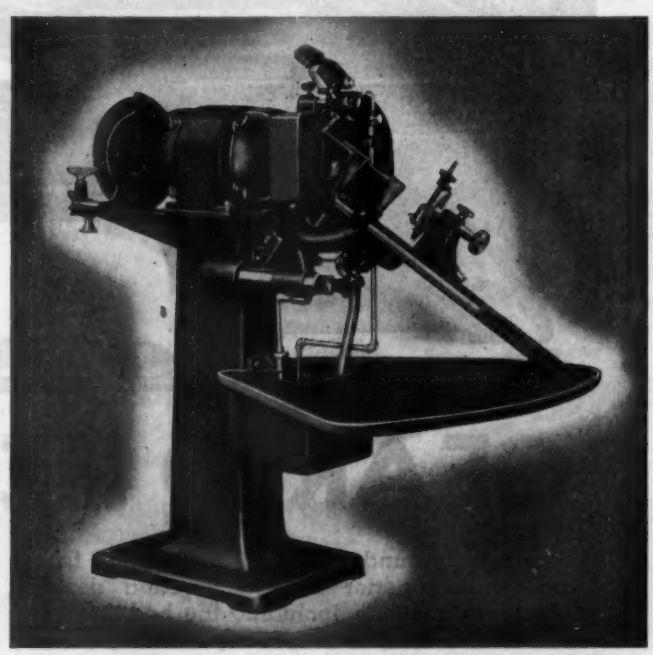
MACHINE SUPREMACY

4 SAFETY ENGINEERED

5 EASE OF OPERATION

6 VERSATILE

te and cut production costs with
vel precision built machines.



Yankee Twist Drill Grinder — More holes per drill means lower production costs per unit. The Yankee, and its twin, the bench model No. 44, are designed to give longer life to your drills.

D YEARS OF ENGINEERING DEVELOPMENT

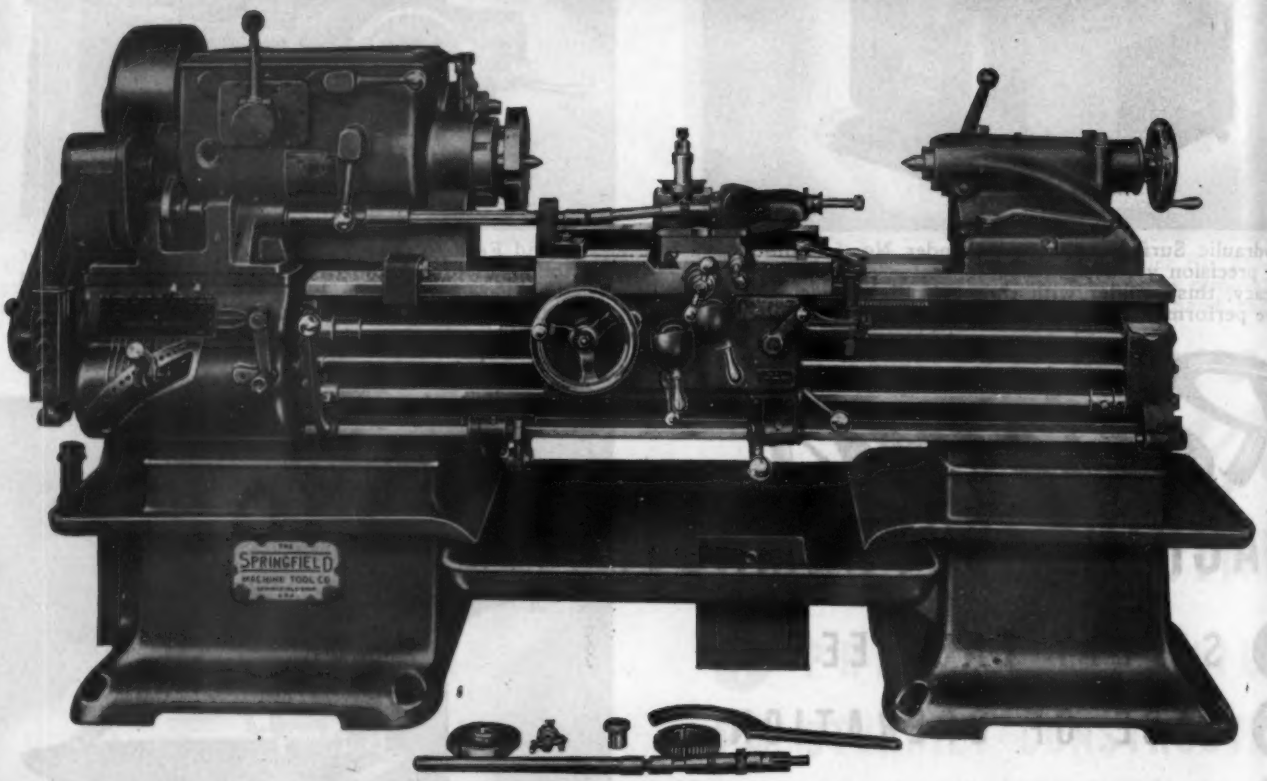
Write for Bulletin A-244

INDUSTRIAL GRINDERS

ARBOR, MICHIGAN, U. S. A.

Choose

SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELD can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

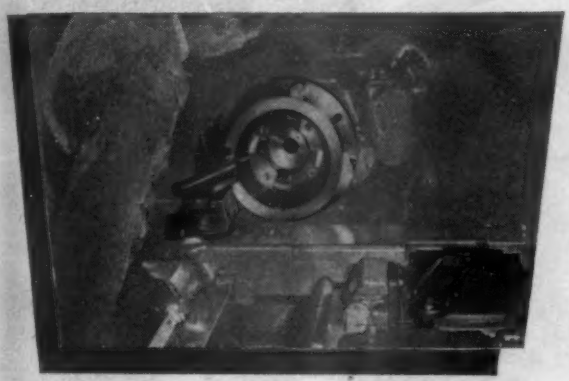
Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL *Co.*

SPRINGFIELD OHIO U.S.A.

Turn tapers the modern way..on *Monarchs*

Extremely acute angles can be turned accurately with the Monarch Taper Attachment Variator. Illustration shows turning 60° included angle.



Acute angle boring from small end of taper is shown here. Ordinarily a difficult job, extremely acute angles can be bored to close tolerance limits with Monarch Taper Attachment Variator.

For steep angle boring, as illustrated, the Taper Attachment Variator can bore (or turn) up to 90° included angle.

Acute angle turning or boring, steep angle boring, form turning and boring and similar work reaches a new "high" in accuracy and speed on Monarch Lathes with Anti-friction Bearing Taper Attachments and Variators. Working from a thin metal template, the shape is transmitted with extreme accuracy to large or small parts.

Far heavier cuts may be taken than with the conventional gib type of taper attachment, yet the tool is guided so smoothly and rigidly that even deep cuts can be made accurately when turning or boring acute angles. The Variator permits turning and boring up to 90° or more included angle . . . and it can also be used as a pantographing device to produce work which is smaller or larger than the template.

Many other examples of taper turning are included in our new bulletin, "Modern Taper Turning," (No. 1955A) which will be sent upon request. Any of our branch offices or representatives will supply additional details.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

622 W. Washington Blvd., Chicago 6, Ill. • 801 Fisher Bldg., Detroit 2, Mich.
635 Industrial Office Bldg., Newark 2, N. J. • 10465 Carnegie Ave., Cleveland 6, Ohio
512 Empire Bldg., Pittsburgh 22, Pa. • *Representatives in Principal Cities*

Monarch Saves Time

Form turning a piece four feet in length is done from a metal template which is only one foot long. Notice the many tapers and diameters, all of which are imparted to the work with close accuracy.

WHEN *Unskilled Labor*

CROSS

New York • Chicago • DETROIT • Cleveland • Dayton

pushes a button

On this Cross Special Machine, truck and tractor axle housings are automatically bored and faced *at new standards for low cost*

This Cross Special Boring Machine is a universal machine for simultaneously boring and facing the banjo housings on a wide variety and range of automotive truck and tractor axle housings. It bores and faces the flanges and inner lugs on front and rear axle housings during a full automatic operating cycle.

The work is located in the fixture with a proper operated gauging mech
automatically dividi
power cl

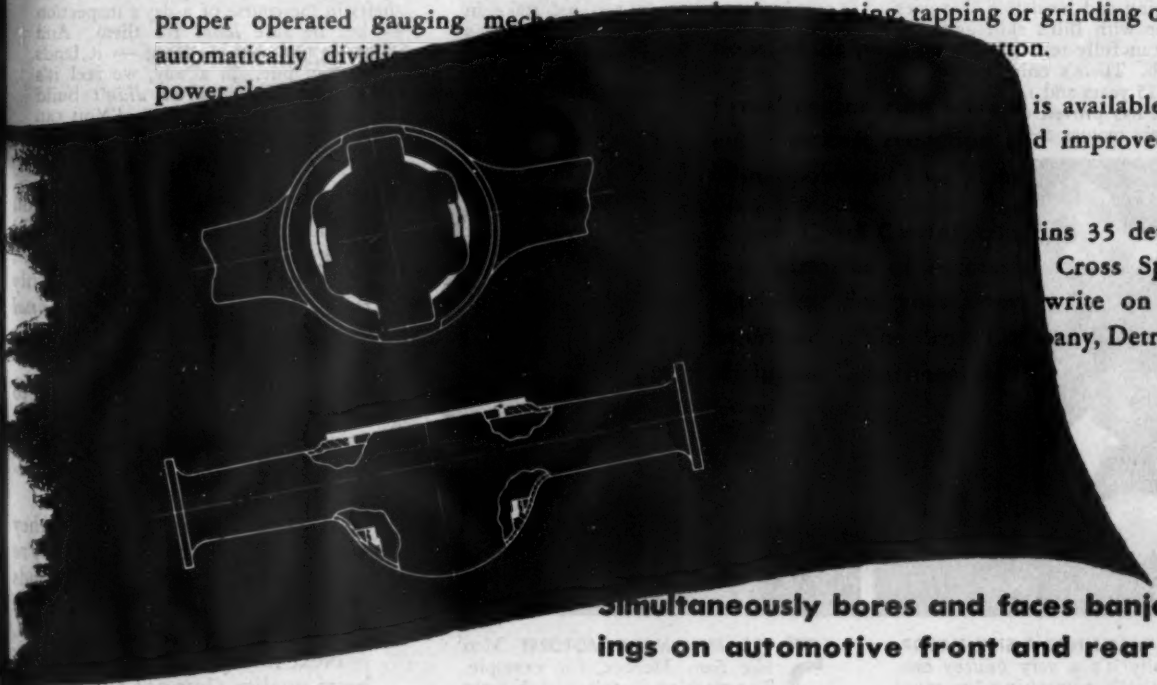
the old practice of manual location, as well as surface plate layout and subsequent gauging to layout lines.

Cross Special Machines, with full automatic operating cycle, eliminate the human element and thereby maintain precision accuracy with unskilled labor.

Other Cross Special Tools include automatic machines for completing any one or a combination of turning, milling, drilling,
ing, tapping or grinding opera-
tton.

is available as a
d improved use

ins 35 detailed
Cross Special
write on your
any, Detroit 7,



Simultaneously bores and faces banjo housings on automotive front and rear axles.

S 15

SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

What Does It Take To Build Great Motors?

1 FOR ONE THING, it takes a lot of *quality* men like Bill Seebode, 30 year man at A-C. There's no machine known that can assemble the maze of wiring and insulation that goes into a stator with Bill's skill and care . . . or that can fully test how *well* he's done his job. There's only one test . . . wait 5, 10, 15 years and *see*. And that's the test that has proved over the years, Allis-Chalmers motors are *great* motors!

2 HUNDREDS OF A-C MEN, proud that they have won and are *keeping* the confidence of engineers and operating men throughout American industry, have a *personal* stake in every motor they build for you. That's one reason why Stan Brothers follows his job so intently . . . as he painstakingly polishes a shaft down to a finish slicker than silk, getting rid of every irregularity that could someday invite failure.

3 TO WATCH HIM OPERATE, you'd think Walter Conner was conducting a one-man scrap drive. Not that he finds many defective motor shafts in the course of a day's inspection — but he sure *looks* for them. And when he finds one — bang — it lands on a scrap pile. In a way, we feel it's the group of motors we *didn't* build that's behind the reputation: "You can *depend* on Allis-Chalmers Motors!"

4 NO—THAT'S NOT A SICK MOTOR. Actually it's a very *healthy* one. But that's something we must know, through generous sample testing, about every motor before it can tackle a job for you. Part of the "physical exam" McGarvey Eddleman is giving this motor is the heat-run test . . . checking speed and temperature hourly while motor runs at full load. It's just one precaution that helps A-C build consistently great motors.

5 YES, MEN MAKE MOTORS! Men like Sam Meister, for example. The machine doesn't exist that can duplicate his skill. With an acetylene torch in one hand, a silver alloy rod in the other, Sam silver-brazes the end connections on famous Allis-Chalmers rotors. Round and round the connections he works — expertly flowing in molten alloy to form a joined structure that can withstand as much heat as though it were a single die-casting.

IF YOU COULD MEET and talk with the men who build Allis-Chalmers motors, you might be surprised to learn how keenly they are aware of the big *personal* stake they have in every motor they build for you.

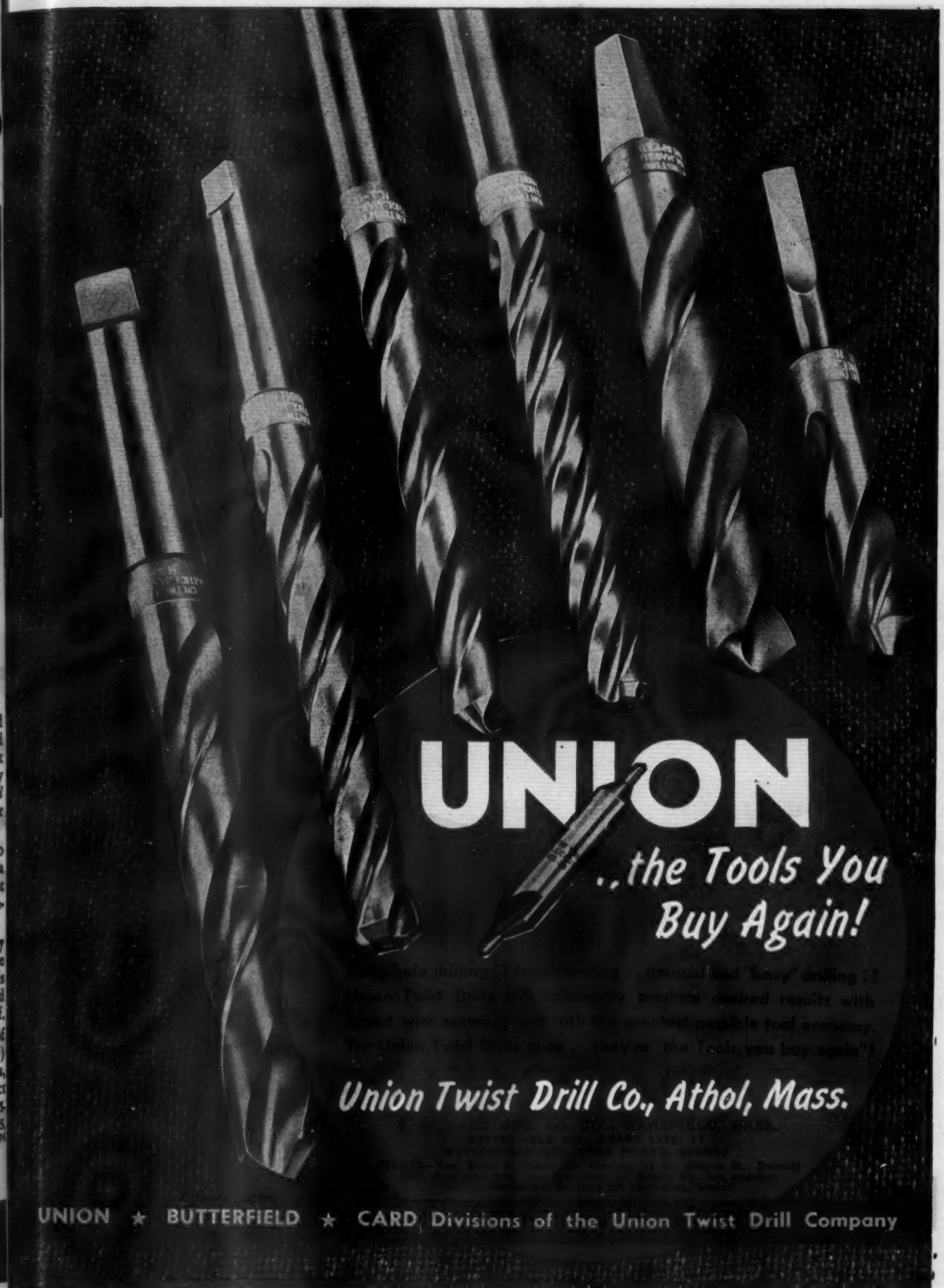
They know that factory tests to fully pre-determine how well a motor is built *just don't exist;* that there's still no substitute for responsible craftsmanship.

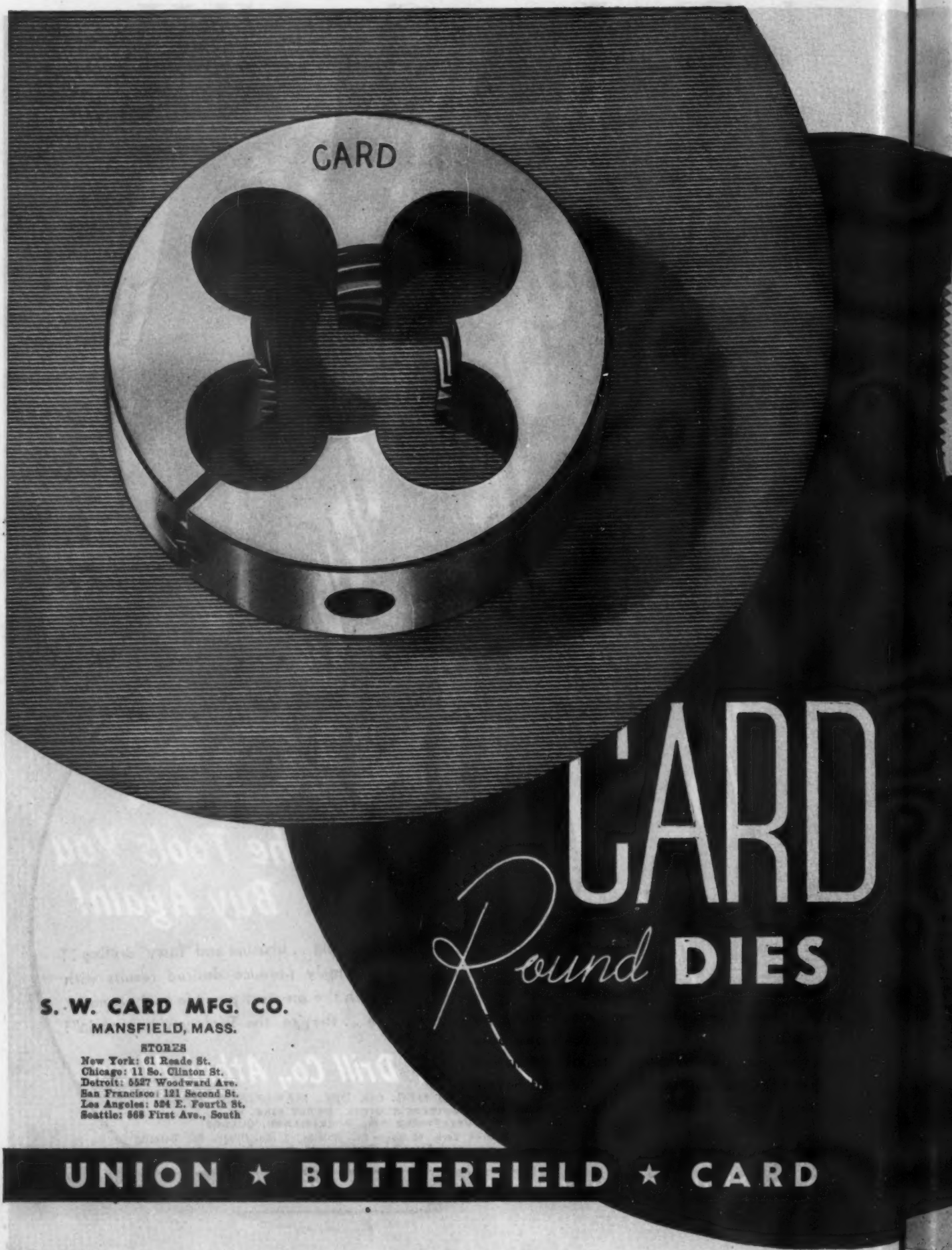
And they know that when they build *great* motors for you they're making *friends* — and that friends are something no company and its workers can have too many of.

Next time you need the kind of extra-quality (but not extra-price) motors Allis-Chalmers builds, check with our nearby district office. Or write direct to ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 1794

♪ *Tune in the Boston Symphony, Blue Network, Saturday at 8:30 pm, EWT.*

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS


UNION
..the Tools You Buy Again!
Union Twist Drill Co., Athol, Mass.
UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company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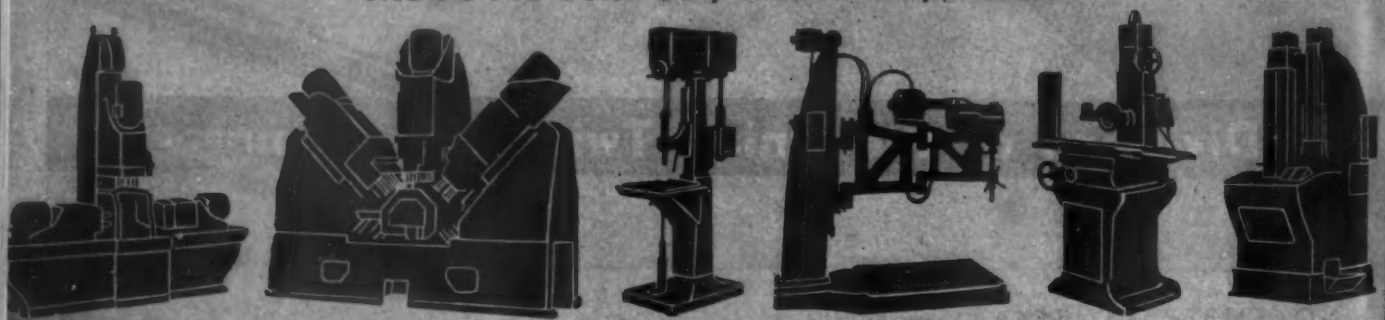

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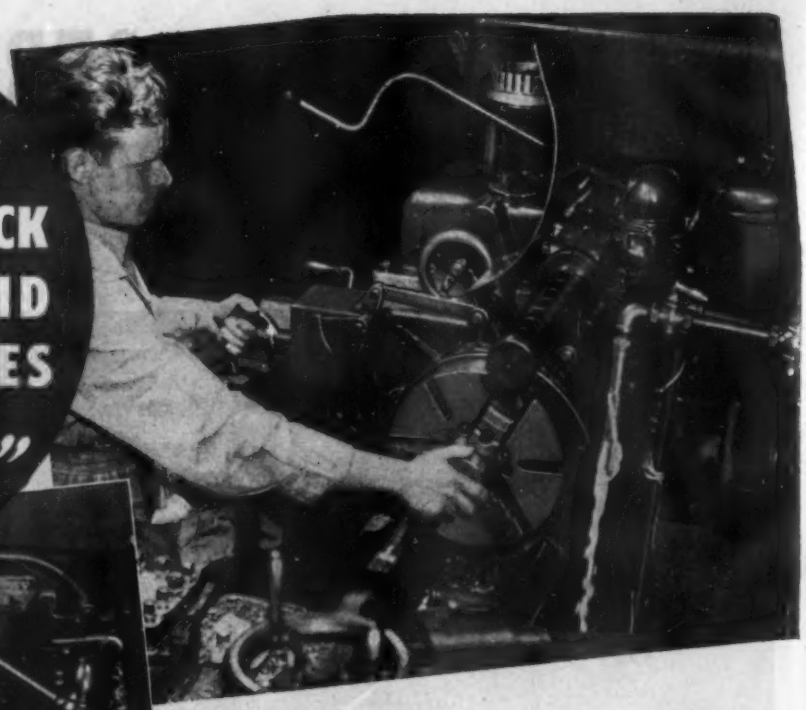

THE C. L. Gougler Machine Company, Kent, Ohio, is running all-out on war work. Their turret lathes are going 24 hours a day. On this basis, their time studies show that a Warner & Swasey Power Chuck Wrench installed on a turret lathe increases machine output to an extent which means that the Power Chuck Wrench has paid for itself in 60 days.

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You can make heavier, time-saving cuts on pieces that are power chucked. Grip pressures are controllable and uniform so power chucking is safe for light-walled, fragile pieces, too. Women operators can be used on chucking jobs formerly restricted to masculine strength because heaving on chuck wrench handles is eliminated. A turn of a knob is all that is necessary. Operator fatigue is a big factor in war production now—it will be a big factor in postwar competition. Easing the work means raising production. Better talk to your Warner & Swasey representative about Power Chuck Wrenches right now. Write Warner & Swasey, Cleveland, Ohio.

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TURRET LATHES, SADDLE AND RAM TYPES — CHUCKING AND BAR TOOLS — TAPPING AND THREADING MACHINES

Britain's Foreign Trade

LONDON—THE BRITISH are worried about their postwar position. It would be strange if they weren't, because they have ahead of them a tremendous task of reconstruction and recovery.

Britain must import in order to live. To pay for imports, she must export goods. Foreign trade thus is Britain's lifeblood, and its flow after the war must be not only sustained, but expanded.

The British want to build up a volume of foreign trade fifty percent greater than in prewar years. If they should come anywhere near that mark, they will be able to bring in from other countries, including ours, the things they will need to maintain their own standard of living at a reasonable level.

But if Britain is to export goods as desired, she cannot give her own people in the next few years all the articles they wish and in some cases badly require. Her own people understand this fact and are willing to make the sacrifices thus entailed for the ultimate good that will come out of it.

Beyond that, the British must be able to produce goods cheaply enough to sell them competitively in world markets. If they cannot do that, the only recourse is to peg export prices by government subsidies, and that is an expensive procedure for a nation already burdened with very heavy taxes.

The logical and sensible thing then is for Britain to manufacture goods at the lowest possible cost. That means favorable labor rates, which the British now have compared with us. It means cheap raw materials, and that constitutes a problem for Britain. It also means more mechanization in order to achieve higher output per man.

The British are keenly aware of the necessity for greater mechanization. Government officials, industrialists and the press are preaching it. Mechanization is really another term for modernization.

Mechanization, in fact, is apt to be forced upon the British through sheer necessity. The task of rehabilitation and reconstruction at home plus the enlargement of export trade is almost sure to use all the available manpower. Hence there will be an extra inducement to mechanize production wherever possible.

Britain is due for far-reaching changes if she is to retain her place as a great world power. Her leaders are conscious of that fact and are making plans accordingly. They are disturbed, and rightly so, by their feeling that the nation's economy is so entwined in the war effort, much more so than ours, that the job of untangling it will be a major undertaking in itself. That job may take long enough that Britain will go into the postwar period handicapped as against other countries.

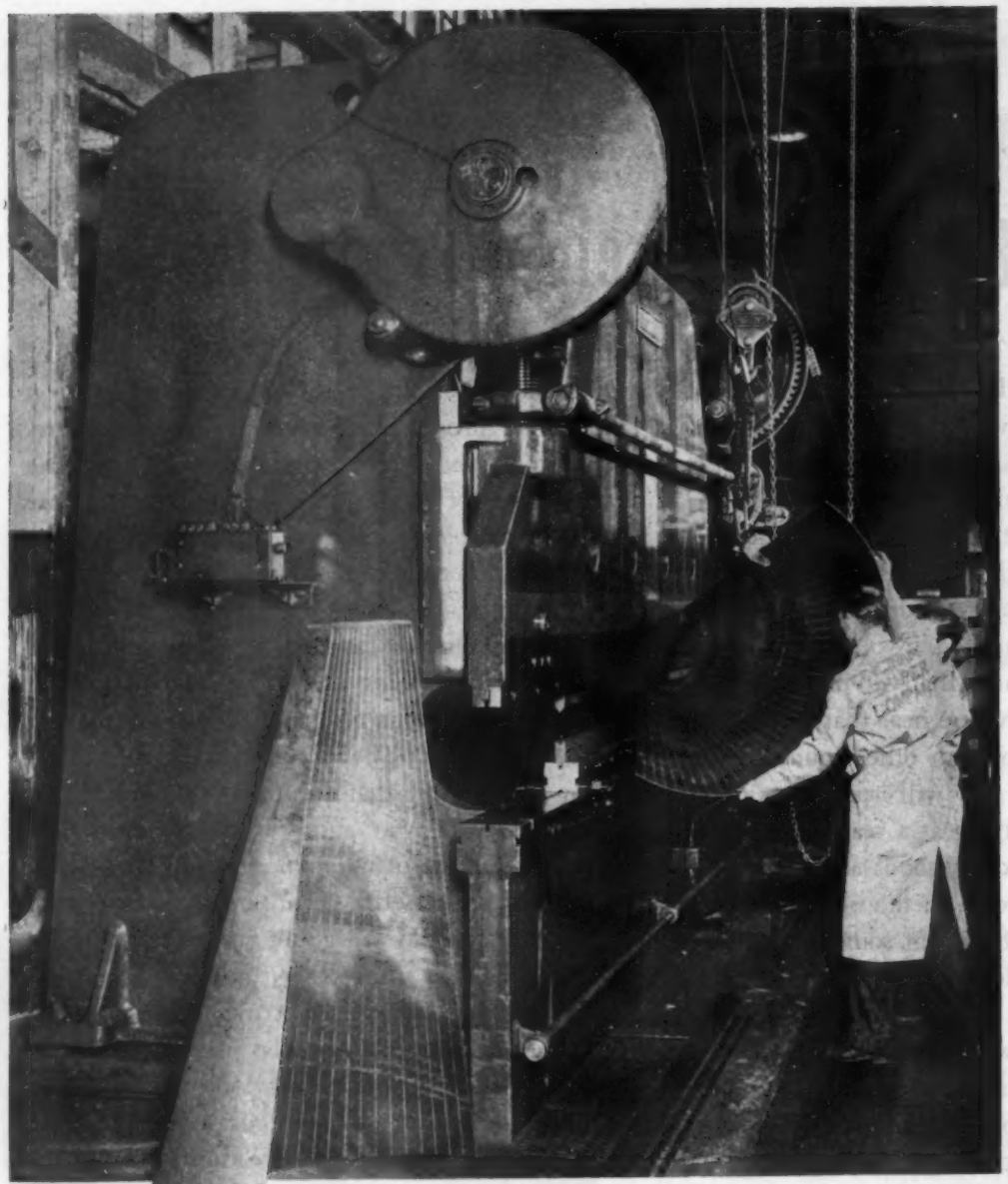
Without for a moment sacrificing our own national good, any American who has visited Britain and has had an opportunity to look into her problems will agree that it is to our best interests to cooperate with her in postwar readjustments so that she can continue to stand alongside us.

This conclusion is not reached on a basis of altruism or sentimentality. For selfish motives alone, the desirability of a strong Britain cannot be successfully challenged.

What can contribute more toward stabilizing world economy and world peace than America and Britain working together rather than at cross purposes?

Conversely, what can jeopardize world economy and world peace more completely and disastrously than for the Anglo-American world to be split apart?

Burnham Finney



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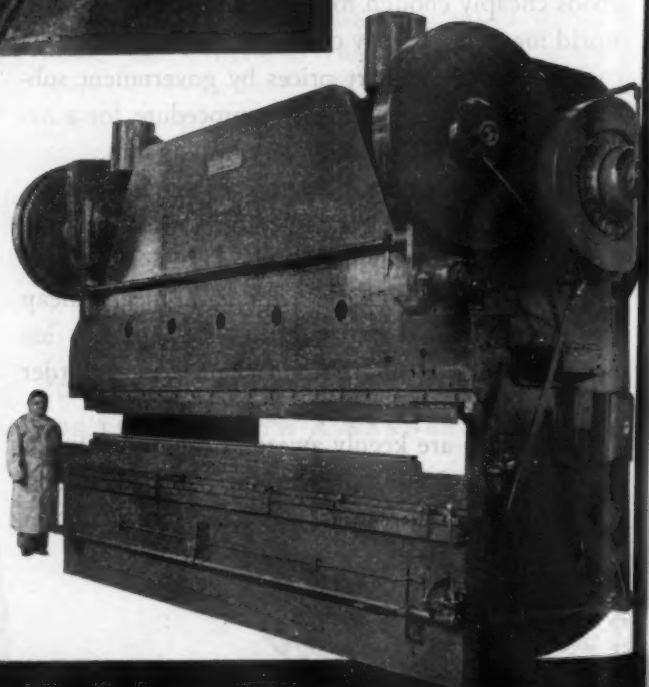

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Sub-Zero Treatment Improves Tool Life of High-Speed Steels

BY T. M. SNYDER, CHIEF METALLURGIST,
CONTINENTAL MOTORS CORPORATION, MUSKEGON

Production checks disclose that sub-zero temperatures as part of the heat-treatment cycle improve performance of high-speed steels by 50 percent and often more

CURRENT INTEREST in sub-zero treatment of high-speed steels springs from potential gains in cutting-tool life and the consequent reduction in machine downtime. Yet despite the fact that the metallurgical principles are comparativly well known, no completely satisfactory sub-zero treatment has been developed. It is true that some treatments have proved beneficial, but others have induced cracking of tools. So in common with other manufacturers, we have attempted to determine the most suitable means of applying sub-zero treatment to high-speed steels. Definite tool-life improvement has been obtained by two methods. One treatment gives somewhat slightly better tool-life performance, the other has the advantage that only one tempering operation is required.

Before going into these treatments, a brief description is in order of the transformations in structure that take place in high-speed steel during heat-treatment. At the hardening temperature the steel is in the austenitic condition, and is to be changed to a martensitic structure by quenching. But it is quite generally believed that no transformation occurs until the M-point (martensite) is reached, which is approximately 420 to 450 F. for the 18-4-1 and 6-6-2 high-speed steels.

It is believed that approximately 20 percent of the austenite remains when quenching is halted at room temperature. When cooling is continuous from the hardening temperature to —120 F., approximately 90 percent of the austenite is transformed. But no thorough investigation has been made concerning the rate of transformation at temperatures below the M-point. Probably the initial transformation progresses slowly, in the range of the M-point it is more rapid, but the reaction slows up as the temperature goes well below zero, for example —90 F. The rate of transformation at —120 F. is very slow and is still slower at —150 F. Utilization of the latter temperature is not commercially practical at the present time. (Ed. Note: An electrical refrigerator was exhibited at the Metal Show for sub-zero treatments at —150 F.)

A further decomposition of the austenite is produced during the tempering of high-speed steel. This decomposition is attributed to precipitation of some of the alloy carbides at the tempering temperature, subsequently raising the M-point of the residual austenite. The product of this decomposition is carbide and martensite or bainite, depending on the temperature at which it is formed. The tempering operation, if properly conducted, can effect almost complete decomposition of the austenite. Transformation products formed in tempering are not as desirable, however, as those formed by means of sub-zero treatment.

When the quenching operation is arrested for several minutes at some temperature slightly above the M-point, the steel is said to be iso-thermally quenched. When high-speed steel is iso-thermally quenched, the thermal gradient is sufficiently reduced to allow for sub-zero treatment off the quench without the usual danger of cracking. The hot quenching bath should be maintained at a temperature just above the M-point of the steel being treated, and extreme care should be used in quenching. Accurate control of quenching conditions is very important. The holding time, to prevent austenitic stabilization, must be limited to four or five minutes.

The cooling in air from the isothermal bath temperature to room temperature effects approximately 80 percent transformation of the austenite. Further cooling from room temperature to —110 F. results in approximately 90 percent decomposition of the austenite.

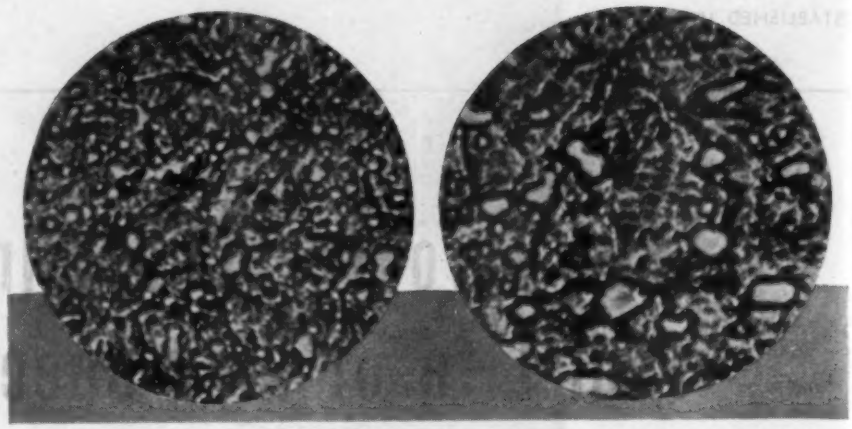
A single tempering operation following the sub-zero treatment of isothermally quenched steels will effect

Compositions of High-Speed Steels Tested

Stock Size, In.	Type	Chemical Composition				
		C	W	Cr	V	Mo
½ × 1	No. 1	0.80	5.50	4.0	1.50	3.05
½ × 1	No. 2	0.73	18.00	4.0	1.00	..

almost complete decomposition of the retained austenite.

To determine the effect of sub-zero treatment, three sets of tests were run on two types of high-speed steel, and the performance of the tools was checked on a crankshaft-checking operation. To serve as a control, Treatment I is the conventional quench and double draw; Treatment II is identical with the exception of sub-zero treatment after the first draw, and Treatment III involves iso-thermal quenching and cooling in air, followed immediately by the sub-zero treatment and then a tempering operation. The types of steel tested and their chemical analyses are listed in the accompanying table.



Figs. 1 and 2—Microstructure of Type 1 steel (left) and Type 2 steel (right) after conventional quench and double draw. Nital etch. Magnification in each case was 2000 times

TREATMENT I

(a) Heat-Treatment:

Both steels were preheated at 1500 F. Type No. 1 and Type No. 2 were quenched in oil from 2200 F. and 2350 F., respectively, until cooled to 800 F., then cooled in air to 200 F., then double tempered at 1050 F. for two hours.

(b) Hardness:

Average hardness of 14 tools (Type No. 1 steel) treated as above was 64 Rockwell C scale.

Average hardness of 14 tools (Type No. 2 steel) treated as above was 64 Rockwell C scale.

(c) Service Life:

The 14 Type No. 1 tools performed ten operations on the average before regrinding. They were reground three times, performing a total of 42 operations on the average.

The 14 Type No. 2 tools performed ten operations on the average before regrinding. They were reground three times, performing a total of 40 operations on the average.

TREATMENT II

(a) Heat-Treatment:

Both steels were preheated at 1500 F. Type No. 1 and Type No. 2 steels were quenched in oil from 2200 F. and 2350 F., respectively, until cooled to 800 F., then cooled in air to 200 F., then tempered at 1050 F. for two hours and cooled to room temperature. Immediately the tools were sub-zero cooled to —110 F. at a rate of 2 F. per minute; held at —110 F. for one hour, warmed in air to room temperature, then tempered at 1050 F. for two hours.

(b) Hardness:

Average hardness of 16 Type No. 1 tools treated was 66 Rockwell C scale.

Average hardness of ten Type No. 2 tools treated as above was 65.5 Rockwell C scale.

(c) Service Life:

The 16 Type No. 1 tools performed an average of 17 operations before regrinding. They were reground three times, performing an average total of 66 operations.

The 10 Type No. 2 tools performed an average of 16 operations before regrinding. They were reground three times, performing an average total of 64 operations.

TREATMENT III

(a) Heat-Treatment:

Both steels were preheated at 1500 F. Type No. 1 and Type No. 2 steels were quenched from 2200 F. and 2350 F., respectively, into a molten drawing-salt (working range 350 to 1100 F.) bath at 450 F., held in the bath for four minutes and cooled in air to room temperature.

Immediately the steels were sub-zero cooled to —110 F. at a rate of 2 F. per minute; held at —110 F. for one hour, warmed in air to room temperature; tempered at 1050 F. for two hours.

(b) Hardness:

The average hardness of eight Type No. 1 tools treated as above was 65 Rockwell C scale.

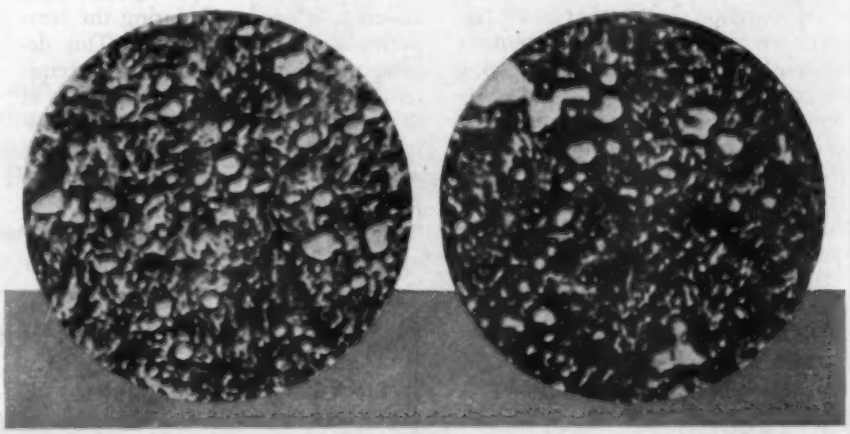
The average hardness of seven Type No. 2 tools treated as above was 65 Rockwell C scale.

(c) Service Life:

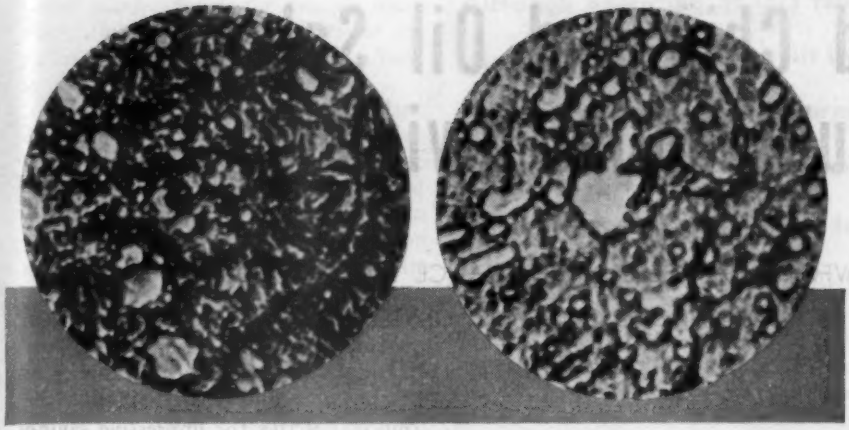
Eight Type No. 1 tools performed an average of 15 operations before regrinding. They were reground three times, performing an average total of 61 operations.

Seven Type No. 2 tools performed an average of 15 operations before regrinding. They were reground three times, performing an average total of 60 operations.

The service records obtained from tools given these treatments reveal that the temper-sub-zero-temper treatment produces slightly better results



Figs. 3 and 4—No great change in microstructure is apparent when Treatment II is given Type 1 steel (left) and Type 2 steel (right). Nital etch. Magnification in each case was 2000 times



Figs. 5 and 6—A small amount of untempered martensite is revealed by the microstructures of Type 1 steel (left) and Type 2 steel (right) after Treatment III. Nital etch. Magnification, 2000 times

than those obtained by the iso-thermal-sub-zero-temper treatment. But the elimination of one tempering operation with practically the same resultant tool life has considerable merit.

Microstructures, representative of the three heat-treatments investigated, were made of each of the two steels tested. There is no apparent difference in the microstructures obtained from treatments I and II. However, the microstructures of treatment III reveal a greater proportion of the light-etching untempered martensite. The presence of a small amount of untempered martensite has not proved objectionable in service.

The tools treated for this investigation were used on an interrupted-cut, crankshaft-cheeking operation. The material machined was NE 9440 with hardness limits of 269 to 302 Brinell. Machine set-up was: cutting speed, 24 r.p.m.; feed, 0.5416 per min., or a depth of cut 0.0225 in.

Several manufacturers of high-speed steel tools have suggested that properly heat-treated tools cannot be improved by any subsequent treatment. However, it is difficult to know at this time just what constitutes proper heat-treatment. Since the service life of the tool is the only test of perfection, any improvement in the service life of the tool also reflects a definite improvement in the heat-treating practice.

The vast amount of work done in the past few years on decomposition of austenite and the tempering mechanism of high-speed steel will undoubtedly result in some modifications in the present hardening practice. This work will probably not be fully appreciated for several years.

It is the author's belief that iso-thermal quenching in combination with sub-zero treatment affords an approach toward the proper heat-treatment of high-speed steel.

Acknowledgments:

The author wishes to express his indebtedness to D. C. Hylland, metallurgist of Continental Motors, and W. F. Matthews, research metallurgist, for their assistance in carrying out this work.

Shrinking Machine Parts With Dry Ice

THE PRACTICE of shrinking machine parts by the use of dry ice is rather well known, having been in use for many years in the machine shops of this country. But there are some details which the average machine shop employee may not be familar with. As an example it may be advisable to consider a shaft made of soft steel, 12 in. in diameter, which is to be shrunk with the use of dry ice, so that it can be pressed into a machined part, which, when the shaft has been allowed to cool to normal temperature after freezing, will make the two parts fit together as though made of one piece. If the shaft of soft steel, which has a coefficient of expansion of 0.0000063 in., is reduced in temperature by 100 F., it will have shrunk approximately .00756 in. in diameter. This is arrived at by multiplying the diameter, 12 in., by the drop in temperature, 100 F., and then by the coefficient, giving the resultant shrinkage mentioned.

In order to determine the reduction in temperature to which a part must be subjected in order to obtain a desired shrinkage, it is necessary to divide the amount of shrinkage needed by the product obtained through multiplying the diameter by the coefficient of expansion. If it is desired to shrink a 12 in. diameter shaft of soft steel 0.010 in., the desired shrinkage, 0.01 in. in this case, is divided by 12 times the coefficient (.0000063), resulting in about 133 F., which is the necessary drop in temperature to obtain the 0.01 in. shrinkage, if that is what is required for the job in hand. It is necessary to know the specific heat, as well as the coefficient, of the particular metal to be shrunk. Any dry ice supplier will furnish data sheets giving such information, but the coefficients of expansion and specific heat for various metals are given here for ready reference.

The formula employed, knowing the specific heat and the coefficient, is the following: Multiply specific heat by weight of the material to be shrunk, and the resultant product by the needed temperature drop. Divide the result by 250, which is the B.t.u. in dry ice at low temperatures. This will then give the weight in pounds of dry ice necessary.

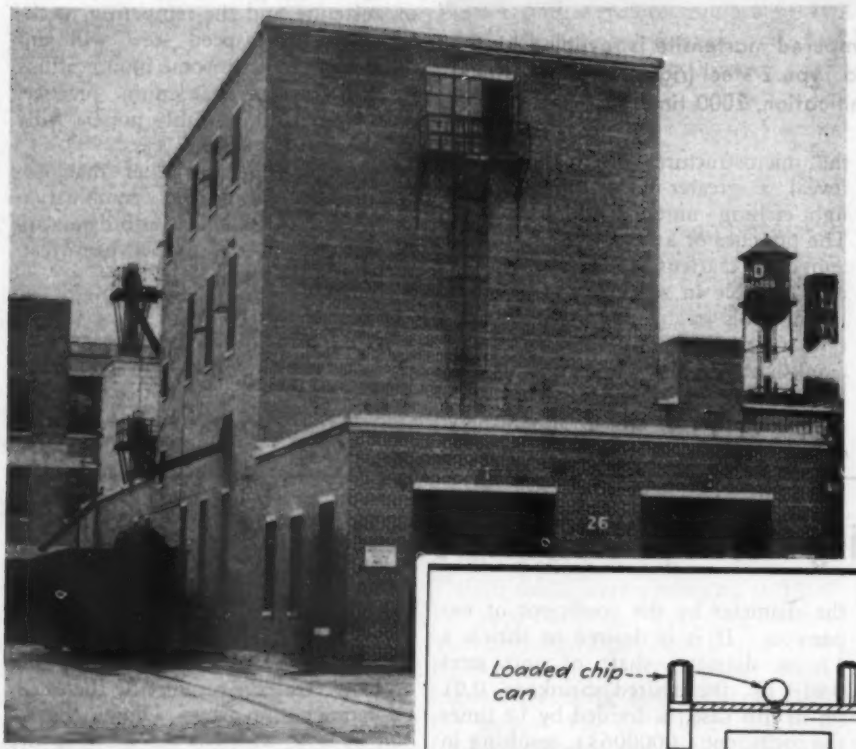
Metal	*Coef. of Expansion*	*Specific Heat*
Aluminum	0.0000128	0.207
Brass (Cast)	0.0000104	0.088
" (Rolled)	0.0000107	0.090
Bronze	0.0000094	0.104
Copper	0.0000923	0.0915
Iron (Pure)	0.0000065	0.101
Steel (Soft)	0.0000063	0.107
" (Hard)	0.0000056	0.104
Nickel Silver	0.0000102	0.095

The use of dry ice in shrinking large parts is frequently resorted to on motor trucks, while transporting them from one plant to another, permitting the parts to cool to the proper temperature while in transit. In such cases the parts are finished to fairly close tolerances in one plant and pressed into another part at a second plant, after being cooled enroute, thereby saving considerable time in the operation.

Alcohol can be used in conjunction with dry ice to speed up the rate of heat transfer in a part being shrunk. In such cases, a watertight container is required. The part is placed in this container, alcohol is poured over the piece and chunks of dry ice are dropped into the liquid. The alcohol causes the dry ice to boil, assists heat transfer, and causes the part to be cooled in a shorter time.

Centralized Chip and Oil Salvage Pays Substantial Dividends

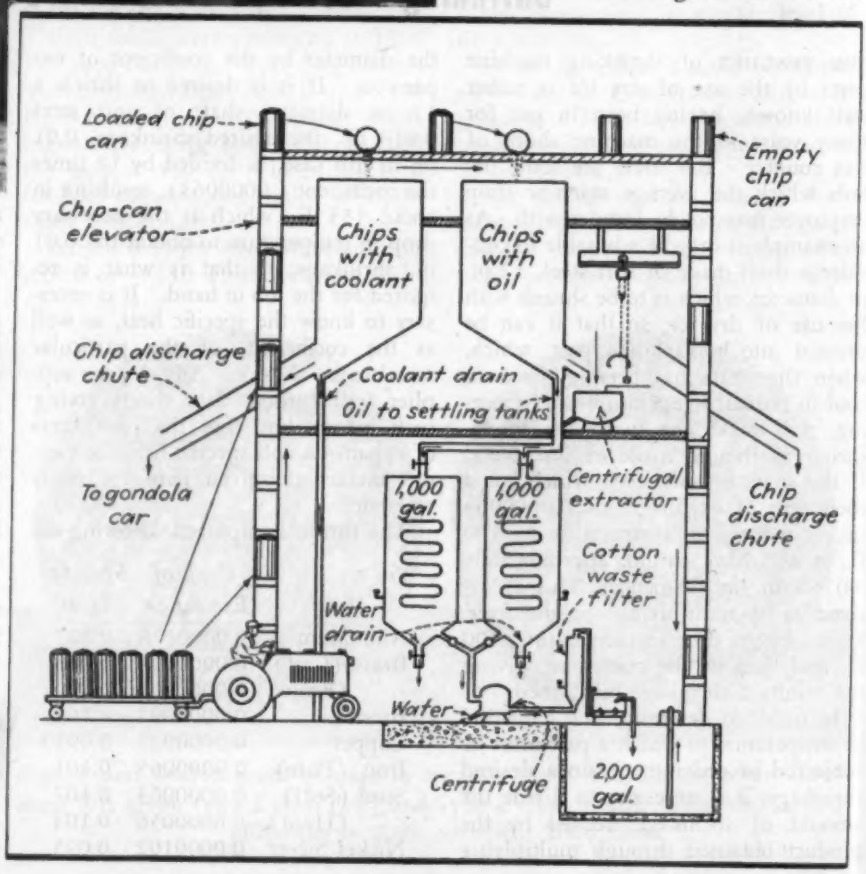
BY CRAWFORD CAMPBELL, MAINTENANCE SUPERINTENDENT,
JOHN INGLIS COMPANY, LIMITED



Only five men on the day shift and three at night are normally required to operate the $80,000 chip house, but this crew has been able to clean from 20 to 30 tons of chips daily, to reclaim 10,000 gal. of cutting oil and other oils per month

OPPORTUNITIES for impressive savings often lie in treating chip cleaning and reclamation of oils and solvents as bulk-material handling operations. This approach is open particularly to the large plant, because the quantities of materials to be handled daily make worthwhile the installation of equipment that will reduce direct-labor costs to a correspondingly low figure.

An example is the experience of the John Inglis Company, Ltd., Toronto, the Dominion's leading producer of small arms. This firm has over 4,000 machine tools, it must dispose of from 20 to 30 tons of chips daily, plus reclaiming important quantities of oils and solvents. As a consequence the management decided to install an $80,000 "chip house" to act as the centralized reclaiming station for the



As the schematic flow sheet discloses, material is lifted to the top floor of the chip house, moved downward for separation and reclamation, as in other bulk-handling operations

entire plant. By doing the job more efficiently and with less labor, the installation is expected to pay for itself in about two years.

The chip house is a three-story plant designed to process 50 tons of chips every 24 hr. if need arises. Chips, of course, constitute the greatest bulk of material handled. Consequently, as in other bulk-handling operations, the chips are hauled to the top floor by conveyor, pass down through drainage bins to the second floor, where they are either centrifuged or dumped direct into chutes leading to freight cars on sidings. Oils and solvent, reclaimed on the first floor, are pumped as much as possible. Five men operate the plant on the day shift.

Details of the installation are:

Several hundred color-coded chip cans are placed in the manufacturing departments of the John Inglis plant. These cans are provided in sufficient number so that pickups need be made only during the day. A salvage force of 17 men follows specified route schedules, loading cans onto special trailers and returning empties. Gas-powered tractors enable the crews to move heavily loaded trailers rapidly about the plant and to the chip house.

The manual labor and time involved in handling chip cans has been minimized by the installation of several conveyors in the chip house. Salvage crews drive into an unloading bay on the ground floor. Here in a few minutes they unload the trailer and pick up sterilized empty cans for another trip. Loaded cans are discharged onto a roller conveyor at one side of the building and empties are picked up

Although operating at less than capacity, the chip house built by a Canadian arms manufacturer will pay for itself in two years, besides helping the shop to obtain better product quality

from a second roller conveyor at the opposite side of the structure. These two roller conveyors serve the can-lifting conveyor and the can-lowering conveyor that rise to the third floor. On the ground floor a transfer station at the lift conveyor is equipped with air interlocks to prevent damage to the equipment by misloading a conveyor carrier.

The top floor of the chip house has a mezzanine equipped with a roller-conveyor loop running over eight chip bins arranged in a rectangle. When the lift conveyor brings a loaded can to the mezzanine, an operator transfers the can to the roller conveyor and thence moves it to the proper bin, according to a color-code system. Cans are coded as follows: light green—aluminum chips; dark green—brass chips; brown—steel chips mixed with soluble oil; blue—steel chips mixed with cutting oil. At the proper color-coded bin, the operator shoves the can onto a dumping fixture that is operated by pedal.

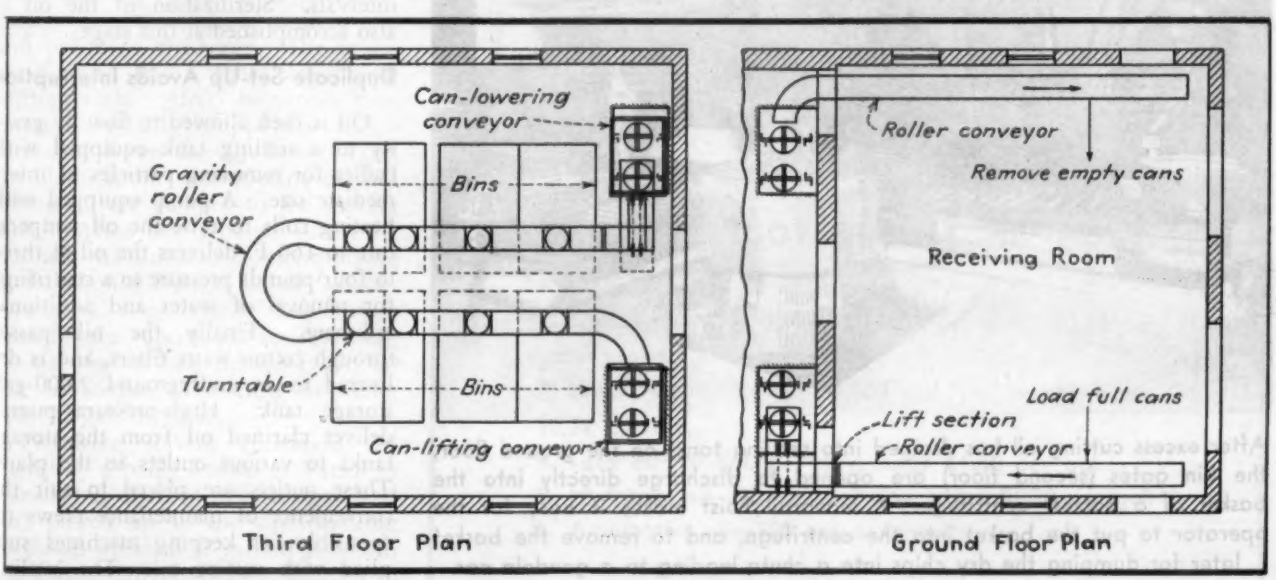
Two chip-cleaning problems are handled with minimum labor in the chip house: (1) Draining soluble oil from steel, aluminum and brass chips, and (2) centrifuging steel chips coated with cutting oil and later reclaiming the cutting oil for further use. Chips coated with soluble oil are sprayed with water for ½ to 1 hr. and then permitted to drain for two days. The water spray speeds removal of the soluble oil, dilutes it as required by Toronto ordinances governing discharge of industrial wastes into the sewer system. Cleansed aluminum and brass chips are dumped from the bins into boxes on the first floor; steel chips are discharged from bin gates on the second floor into chutes leading to gondola cars on sidings along both sides of the building. Cars are moved under discharge spouts by a power-driven car spotter (capstan and cable) controlled by pushbutton.

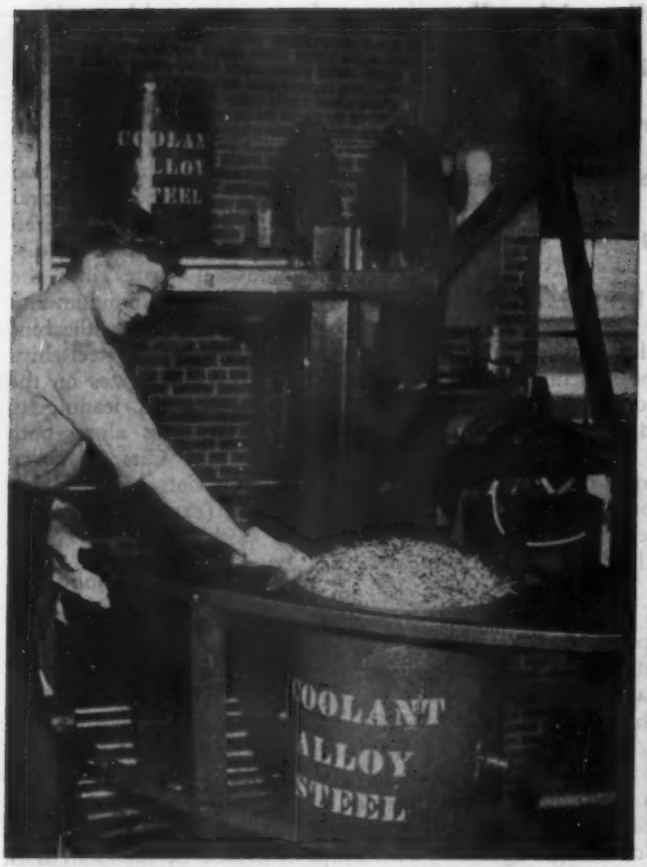
Cutting-Oil Reclamation

Chips coated with cutting oil are dumped into the proper bins. Drainings are piped to two 1,000-gal. settling tanks located on the first floor. After the chips have drained for a sufficient period, they are processed in centrifugal extractors located on the second floor, to remove as much adherent oil as feasible. The basket of dry chips is moved by monorail hoist and dumped into a chute leading to a gondola car. Oil recovered by the centrifuges also flows into the settling tanks.

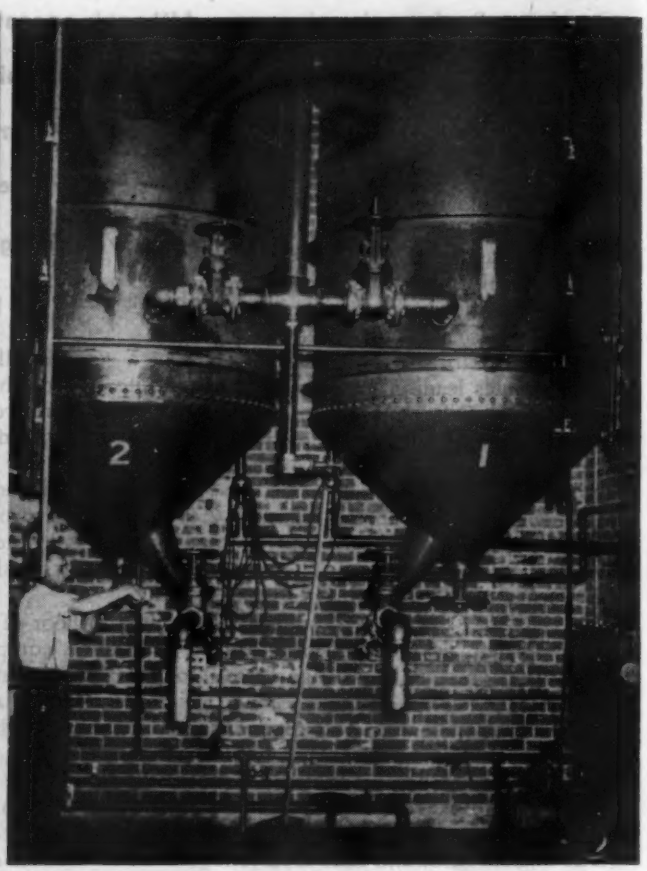
Clarification and sterilization of cutting oil progresses through these stages on the ground floor: (1) Desludging and removal of heavy particles, (2) the trapping of intermediate particles by a baffle-equipped tank, (3) centri-

Conveyors do the work: A can-lifting conveyor takes filled chip cans to the third floor, a roller conveyor there provides easy movement of cans to the proper bins for dumping, and a can-lowering conveyor returns the empty cans to the ground floor for return to various manufacturing departments

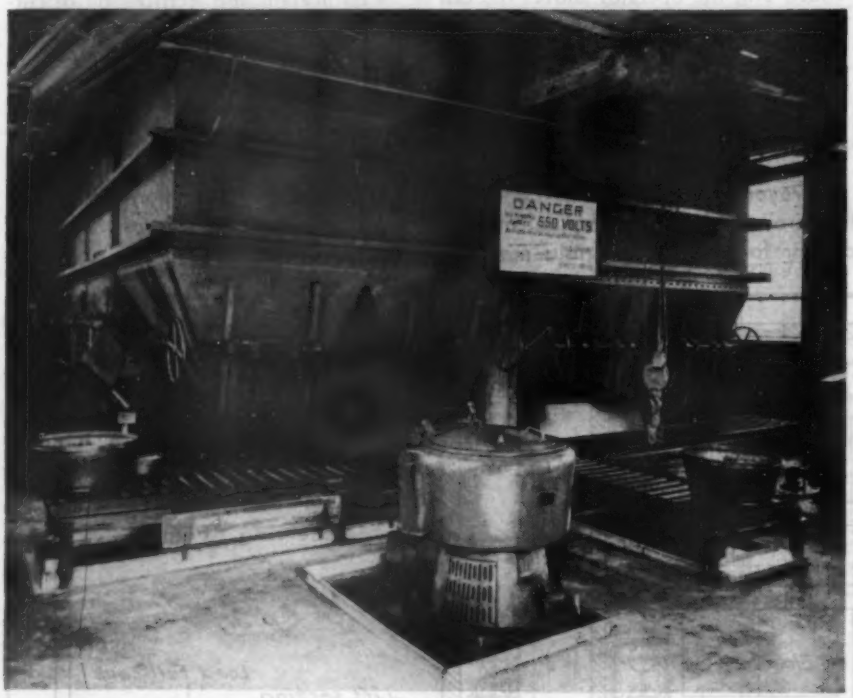




Delivered on the third floor by the can-lifting conveyor, a loaded chip can is quickly transported to the proper bin by means of a gravity roller conveyor



When these two 1,000-gal. tanks are full of contaminated cutting oil, steam is admitted to coils that raise the oil temperature to 140 F. for eight hours

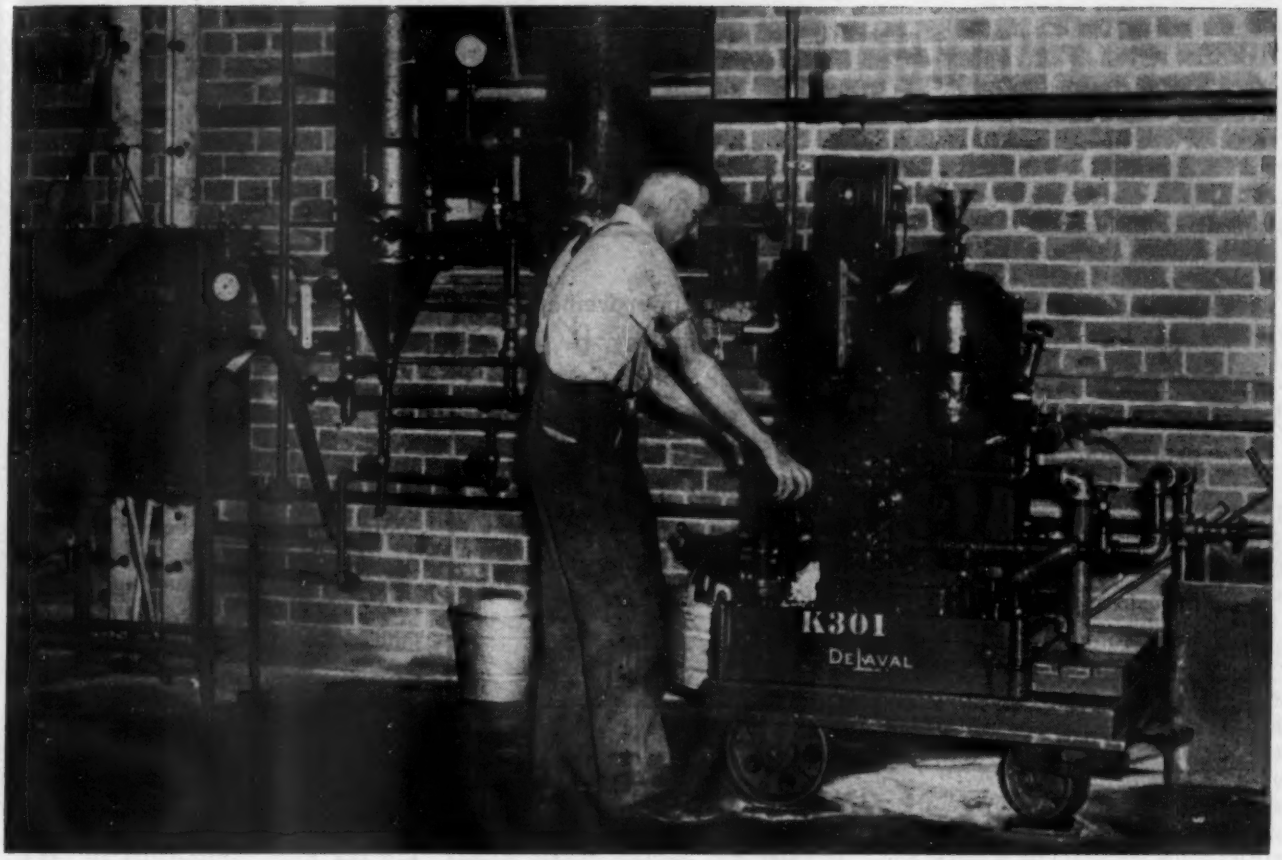


After excess cutting oil has drained into settling tanks on the ground floor, the bin gates (second floor) are opened to discharge directly into the basket of a Barrett centrifuge. A monorail hoist makes it easy for the operator to put the basket into the centrifuge, and to remove the basket later for dumping the dry chips into a chute leading to a gondola car

fuging to remove water and fine particles, and finally (4) filtering. When either of the settling tanks is full, as revealed by a float gage, the temperature of the oil is raised to 140 F. by a steam coil and is held there for a period of eight hours. The heating action reduces the viscosity of the oil so that particles and sludge fall to the bottom, where they can be removed at intervals. Sterilization of the oil is also accomplished at this stage.

Duplicate Set-Up Avoids Interruption

Oil is then allowed to flow by gravity to a settling tank equipped with baffles for removing particles of intermediate size. A pump equipped with heating coils to raise the oil temperature to 160 F. delivers the oil at three to four pounds pressure to a centrifuge for removal of water and additional sediment. Finally the oil passes through cotton waste filters, and is delivered to an underground 2,000-gal. storage tank. High-pressure pumps deliver clarified oil from the storage tanks to various outlets in the plant. These outlets are placed to suit the convenience of maintenance crews responsible for keeping machines supplied with cutting oil. The settling



After another settling in a baffle tank, the oil is picked up by a DeLaval pump and delivered to a centrifuge that removes water and finer particles. The pump is steam-jacketed, raises the oil temperature to 160 F. for better centrifuging action

tanks and cotton-waste filters are provided in duplicate, plus suitable bypass piping, so that a failure of one unit will not stop the oil-reclamation process.

Other Oils Reclaimed

Various other oils are also reclaimed on the first floor of the chip house. Used lard oil, hydraulic oil and automotive oil are accumulated in drums and processed separately. The drums are dumped into a three-compartment settling tank. After the proper time interval, the oil is pumped to a vacuum filter and drawn through fuller's earth for clarification. Chambering oil and rifling oil are pumped to the settling tank. After one type of oil is reclaimed, the clarification-system piping is thoroughly drained before another type of oil is processed. Reclamation rates for the various oils are: Lard oil, 90 gal. in 16 hr.; hydraulic oil, 90 gal. in 16 hr.; chambering or rifling oils, 90 gal. in 16 hr.

Petroleum solvent (Standard Oil Company product known as Varsol in Canada) is distilled to remove oil and dirt picked up in the parts-washing machines installed at various points in the plant. Dirty solvent is brought to the chip house in 45-gal. drums and is pumped into two 1,000-gal. outside settling tanks. After settling for half a day, the solvent is pumped into a vacuum still that operates at 400 F. and can reclaim 100 U. S. gal. per hour. Reclaimed solvent is piped to a third 1,000-gal. tank outside the chip house. As required, reclaimed solvent is drawn off into drums and transported to the plant. Drums of Varsol are appropriately color tagged to indicate new solvent, reclaimed solvent and dirty solvent.

By centralizing chip cleaning and reclamation of oils and solvents, and by providing adequate bulk-handling equipment, five men are able to operate the chip house on the day shift and three men on the night shift. During the day, two men handle the dumping of chip cans on the third floor of the building, two more men on the second floor operate the centrifuges, and one man on the ground floor takes care of solvent and oil reclamation. During the night fewer men are needed, because the chip-can pick-up crew is off duty, and only cans accumulated at the station need be processed.

MATERIAL RECOVERED BY CHIP HOUSE

1. Steel chips——20 to 30 tons daily.
2. Cutting oil—10,000 gal. per month, value $0.34 per gal.
3. Varsol cleaning fluid—1,500 gal. per month, value $0.19 per gal.
4. Lard oil—90 gal. per day, value $1.30 per gal.
5. Hydraulic oil—90 gal. per day, value $1.30 per gal.
6. Automotive oil—100 gal. per month.

Further Comment and Suggestions

Ten questions bearing on machine tool improvement were propounded and answered recently by H. T. Johnson director of Standards General Motors Corporation. The questions dealt with such subjects as standardization, increased speeds and feeds, and chip disposal. Mr Johnson's published discussion created considerable interest on the part of machine tool users. Copies of the questions were distributed by two large industrial firms to various personnel and an analysis of their comments is presented herewith.

Chip disposal innovations to cope with increased speeds and feeds are among recommendations of the men questioned on the subject

Comments by G. E. Men

OPERATIONAL AND MAINTENANCE features of hydraulic feeds on machine tools "should and can be improved," in the opinion of General Electric employees who were asked for comment on the question "How Can Machine Tools Be Improved?" Individual comments by G.E. men on various points of the subject follow:

• Standardization:

1. Something should be done about standardizing on punch press identification. If all punch press manufacturers would number their presses by capacity, for example, a 30-ton press should be called a No. 30, then in purchasing such a machine it would be referred to as No. 30 regardless of who manufactured it. Special features could be identified with a letter such as No. 30-A-B-C, etc. The way presses are now marked by the manufacturer compels the purchaser to mark the capacity on the machine for the operator's information.

2. Standardize on draw collets for all machine tools so that they will be interchangeable to millers, lathes, speed lathes, grinders.

3. Standardize the spindle size and thread for mounting chucks and faceplates on engine lathes and turret lathes so they would be interchangeable.

• Increased Speeds—Heavier Machines:

1. Spindle speeds and table feeds as indicated by plates on milling machines should give actual ranges that are available. This is also important on drill presses, boring mills and lathes. A large number of machine tools today have plates or charts that are not accurate and it is necessary to calculate the speeds and feeds. This causes much confusion among operators.

2. The high and low speed machines should be retained because of the wide range necessary in feeds and speeds for up-to-date machine practices. With all these feeds and speeds incorporated in one machine, it would necessitate a mass of gearing and variable-speed motors. All motors should be constant speed, pushbutton control.

3. Some thought should also be given to die steels, cutters and machines used in making drop forge dies, as the materials the forge shop is called upon to forge today requires tougher die steels, better cutters to sink the impressions and heavier machines to handle the cutters.

• Hydraulic Feed:

There was a difference of opinion on this question. Divisions having most experience with hydraulic feed favor it for certain application. However, all agree that operational and maintenance features should and can be improved. In substance, the comments comprised:

"It is felt that hydraulic feeds are generally satisfactory. The pulsations sometimes observed affect precision work but this effect is no worse than it would be with a mechanical feed. In order to obtain the best results with a hydraulic feed, three points should be kept in mind: 1. A definite maintenance schedule must be followed rigidly; 2. The machine and oil must be kept at a constant temperature, or corrections must be made for changes in temperatures; 3. Since hydraulic controls are usually developed for use with a specific oil, the manufacturer's recommendations should be followed exactly, and the substitution of an oil which is just as good or superior should be avoided.

• Finish of Machine Tools:

1. A well-finished machine tool tends to stimulate the operator's pride in his machine and work, and therefore helps him to keep the machine cleaner and properly maintained.

2. We agree on this question, except that all machine tool builders should standardize on one color. This

for Improvement of Machine Tools

would make a machine shop layout or set-up very attractive instead of the usual different colors.

• Accuracy:

1. Machine tools should be designed to produce better finishes and more accurate work. These improvements would also result in better cutting tool utilization.

2. The general trend in all the mechanical fields is for greater accuracy to eliminate selective assembly and better finishes for longer life of wearing parts.

• Chip Disposal:

1. The present chip disposal on machine tools has not changed much in the last generation. There could be more satisfactory methods.

2. Chip disposal problems are more acute today than ever. This is particularly true with increased speeds and feeds, together with new cutting techniques. In our opinion this condition is getting progressively worse and will require radical engineering as well as new approaches to the problem.

3. Chip disposal on machine tools at present is a real problem. Faster

cutting speeds increase this problem. Provision should be made for air suction on machines for disposal of chips when machining light metals such as magnesium and aluminum alloys. In many shops improvised sheet metal guards are installed on machines to protect operators from chips. In most cases these guards are deficient.

• Lubrication:

1. Under this question, mention should be made of coolant systems. Machines should be provided with improved methods for supplying coolant in the proper volume and force to dissipate the heat from tools and work.

2. The coolant system should provide efficient screening so that small chips are not carried back to the work in the coolant stream. Refrigerated coolant is necessary on machines where work is machined to close tolerances.

• Electronic Controls:

1. Electronic control on some types of machine tools is very desirable and efficient.

2. It would be desirable to have electronic control on large boring mills and lathes to maintain a constant cutting speed at all diameters when facing across surfaces. It would result in more efficient material removal, improved surface finish and better chip control.

Sperry Supervisors Give Views

MACHINING SUPERVISORS in the Sperry Nassau Plant Manufacturing Engineering Department were asked for their views on machine tool improvement and the following cross-section analysis of their comments reemphasizes important points already published and some new recommendations.

• Standardization:

1. Standardization should concern itself primarily with interchangeability of small tool accessories between machines of like capacity. Establishment of this interchangeability entails the standardization of such elements as collets, chucks, turret holes, tee slots, spindle tapers, and change gears, together with the abandonment of the questionable practice of using mongrel thread sizes on perishable parts of standard tools.

2. As applied to the machines themselves, standardization should be used only in moderation. We buyers of machines will always want better ones this year than we bought last year; an apathetic standardization of machine design will not help. However, in the following instances standardization would be instrumental in maintaining smooth production under carrying work load conditions in that they would eliminate the existing necessity of confining the use of tools and fixtures to a single make of machine: Table to spindle distances on horizontal precision boring machines, faceplate dimensions, drill press spindle noses, and table tee slot relations.

• Increased Feeds and Speeds, and Heavier Machines:

1. Speeds and feeds should keep pace with the development of cutting tool materials, and cutting techniques. However, a broad picture of the manufacturing industries should show a marked trend away from heavy roughing cuts as a result of recent improvements in die and precision castings. This leads us to believe that the key points should be higher speeds, no change in feeds, and greater precision. Most of the improvements in machine design, required to accommodate these factors, are covered in the answers to subsequent questions.

2. The requirements of the individual consumer must govern the size and capacity of machines, there being as much need for light precision machines as for the heavier more powerful variety. It is significant, however, that the demands of higher speeds and precision will include greater input, improved bearing design, the elimination of vibration through the use of flywheels and flexible drives, and the elimination of casting creep through proper aging or better heat-treatments than are now in vogue.

• Hydraulic or Mechanical Feeds?:

1. In spite of the advantages which hydraulic feed mechanisms have to offer in versatility and ease of adjustment, it is the consensus that they cannot compete with the mechanical in those fields of production which demand positive and invariable feeds, such as thread and gear cutting. Where several feeds are required simultaneously, as in turret lathe work, there is little preference, while in fine-feed precision work the hydraulic mechanisms are definitely indicated.

2. The first steps have already been taken in the application of refrigeration units to the task of maintaining constant the temperatures of hydraulic fluids and machine elements. Further developments in this field may well bear watching.

3. Our chief objection to hydraulic systems is the high cost of maintenance due to the inaccessability of trouble spots. We trust that the natural course of development will result in better feed regulating valves, and fluids less affected by temperature changes.

• Electric Controls:

Properly standardized between manufacturers, electrical controls will be instrumental in the world-wide effort to eliminate the "human element." However, we don't want to make electrical engineers out of our operators, so our preference is qualified by need for similarity in control boards.

• Finish of Machine Tools:

The supervisors agreed almost unanimously that present emergency finishes on machine tools are satisfactory.

• Accuracy:

It is altogether possible that we instrument manufacturers get maximum accuracy out of the machines we operate, and if postwar machines have more accuracy to offer, we would find good use for it.

• Chip Disposal:

On a few types of machines that do not create chips in large quantities, the disposal facilities are adequate, but there is a definite feeling that most machine tool manufacturers have "missed the boat" in this respect, and that there is considerable room for improvement along the lines of chip separators, conveyors, and vacuum attachments; the latter may well be applied to mills and drill presses.

• Lubrication:

The answers to this question were almost universally in favor of a central feeding system which would operate automatically and draw from a central sump. These systems, however, should be equipped with several accessible filters in parallel to prevent stoppages.

• Hardened and Ground Ways:

The demands a machine makes of its ways varies with the use to which it is put. High-production machines, where extreme accuracy is not of primary importance, but where cyclical frequency is high, are better designed with wear-resistant hardened ways. On the other hand, precision machines require the trueness and superior bearing characteristics of scraped ways.

• Electronic Controls:

The field of electronics offers possibilities not only in control but in measurements being taken during machine operation, and may effectively minimize mechanical inspection operations. This would indeed be an attractive innovation in single operation precision machines where handling for inspection purposes presents problems in part protection and loss of time.

Carbide Cutters on Old Machines

OUTSTANDING INCREASES in production are being secured in the machining of most metals by the use of carbide cutters when the necessary requirements and conditions are understood. Cutting speeds far in excess of those possible with high-speed steel are possible when the work is stiff enough to stand the impacts and pressure of the cutter, when the fixtures are sufficiently rigid and when both the bearings and the feeding mechanism of the machine are good enough to handle the increased speed and pressure. The situation is much like that resulting from the introduction of high-speed steel when the machine tools had been designed to use carbon tools at much slower speeds.

This is brought to mind by a recent visit to a shop where comparatively new milling machines were having serious bearing trouble when speeded up to use carbide cutters. Although the speeds being used were nowhere near the maximum obtained with the cutters on newer and heavier machines, the time saved by the higher milling speeds was largely offset by the cost, in both production and repairs of the down time of the machine.

One reason for the failure to secure better results was running the cutters after they had become too dull for efficient work. This was done to avoid stopping the machine to change cutters before the end of a shift, and because the work produced still had a satisfactory finish. It is partly because negative rake cutters continue to leave a good surface after they are no longer efficient, that they are too often run beyond the economical limit. Dull cutters impose unnecessary stresses on the machine and also make it necessary to remove too much carbide when the cutters are ground. It then takes much too long to grind the cutter and wastes carbide. Those with wider experience in using carbide milling cutters find it much more economical to have spare cutters so that but little time is lost in changing them when the edge begins to dull.

It is found that flywheels help when using carbide cutters and higher speeds on older machines. Even new and heavier machines find that flywheels help in securing better work. They also help the bearings of the machine. A heavy flywheel minimizes the effect of the teeth striking the work by preventing any appreciable slowing of the cutter as the tooth contacts the work, and the tendency to speed up as it leaves the cut. This is particularly true with cutters having but few teeth, as is the tendency with high speed and a definite chip thickness per tooth. The flywheel also increases the effectiveness of the smaller powered motor and helps in securing a more uniform feed.

Cutters of any kind last longer when a "down" or climb feed is used, in slab milling. They also produce a better finish on the work. Down feed however requires a positive feed with little or no backlash. Feed nuts are now made that compensate for wear and give a positive feed. Higher cutter speed does not require the same freedom from backlash as with slow speed, but the feed should be as positive as can be secured with the machine being used.

Easily Made Compressed Air Cylinder Has Many Uses

Low cost device provides holding pressures from 400 to 600 lb. per sq. in. when used with shop lines having 80 lb. pressure per sq. in.

BY C. W. HINMAN

THE APPLICATION of small compressed air cylinders for holding work in jigs, milling and assembly fixtures are endless in number. Fifty or more cylinders may be used in one setting for airplane wing assemblies. The accompanying illustration shows a low cost air cylinder which operates automatically. The view is a vertical section through a center plane of the cylinder.

Body *A* is a suitable length of cold drawn steel tubing, the inside diameter of which is 1½ in. This diameter gives a piston head area of 1.767 sq. in., and using the ordinary shop pressure of 80 lb. per sq. in., a piston thrust of 1.767 × 80, or 141 lb., is the result. By arranging the operating leverage to multiply the power three or four times, a holding pressure on the work of 400 to 600 lb. is attained.

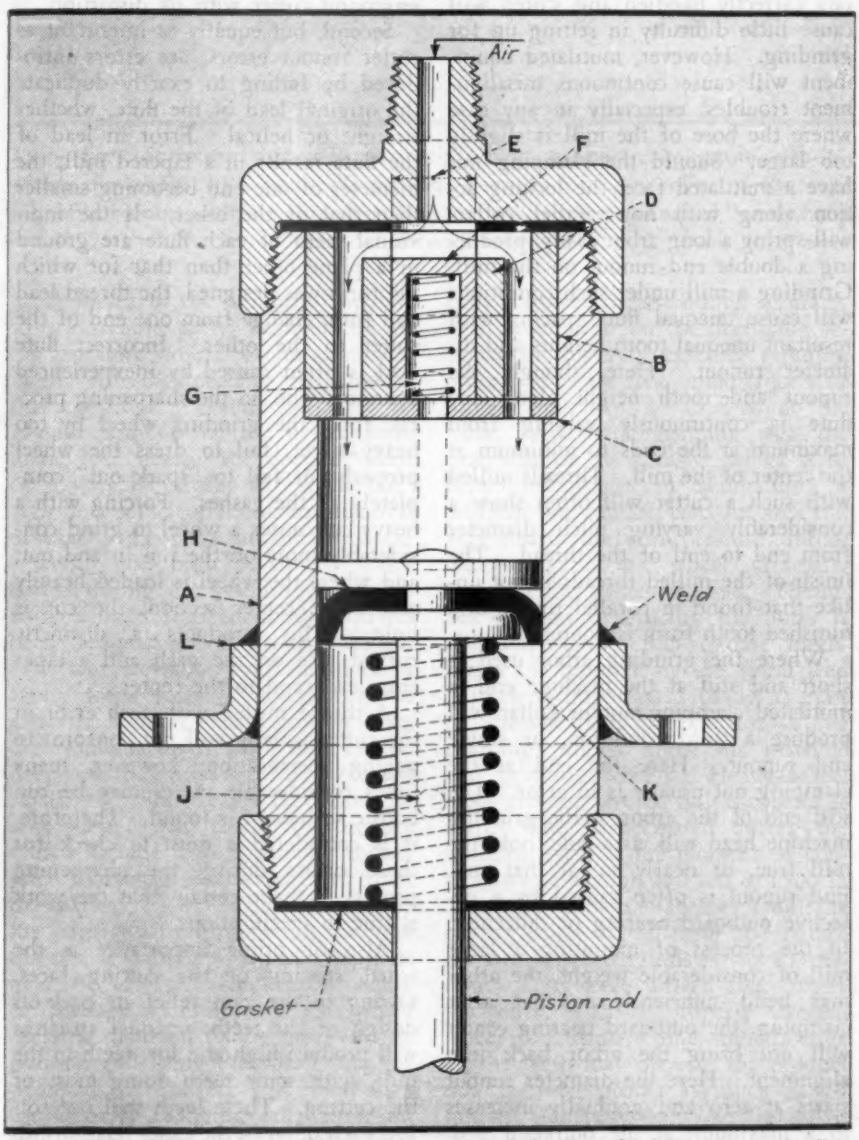
Parts *B* and *C* are turned on a lathe and are press fitted against a square shoulder turned in the upper end of the cylinder. These parts have two vent holes *D* which have right angled openings into center hole *E*. *E* is provided with thimble *F* within which a light compression spring is inserted. The thimble is an easy sliding fit in hole *E*, and the power of the compression spring is just sufficient to raise the thimble against the upper cap, and action that closes holes *D* when the air is shut off. Behind *F* is exhaust hole *G* which leads down through the wall of the cylinder and opens into the cylinder below piston head *H*, at point *J*. Construction of piston head *H* is similar to usual tire pump designs and has a leather washer. However, it is larger, heavier and stronger than usual piston heads of that type.

In operation, the piston head is normally positioned against plate *C*, when air pressure is off. When the air valve is opened, it can operate one, or many cylinders from a remote control valve, the air pressure instantly depresses *F*, which opens *D* and closes *G*. The result is that the piston head moves down and its attached piston rod operates the clamps on the work.

When air is shut off, *F* rises instantly and closes *D* and opens exhaust hole *G*. The trapped air, which is 80 lb. per sq. in., or more, immediately escapes through holes *G* and *J* and lifts the piston head in unison with compression spring *K*, the latter exerting a power of from 8 to 10 lb.

The trapped air is the initial boost that loosens clamps which have been locked by the downward thrust of the piston. The action of the trapped air for a booster is similiar to returning the explosive pressure in a Garand rifle to operate the magazine which automatically reloads the gun.

Mounting bracket *K* can be welded on the cylinder at any convenient position, but by using setscrews, the bracket can be adjusted to different positions. If these cylinders are made in quantity production, production should be at a cost of less than $1.50 each.



This easily and economically made compressed air cylinder automatically clamps, holds and releases work in jigs and fixtures

Multiple Thread Milling Cutters III

Careful Cutter Sharpening Equal in Importance to Proper Design

BY ROGER W. BOLZ, NATIONAL CARBON COMPANY

Three types of runout which occur through faulty equipment may cause uneven thread form and reduce cutter life greatly

ONCE a satisfactory multiple thread mill has been designed, the first half of the goal has been achieved. The second, and equally important half, is the handling and sharpening the mill. This is of great importance, since all the accuracy and life obtained by meticulous design and manufacture can be lost through carelessness.

To maintain all the accuracy and life built into a ground thread mill, maximum care and control must be exercised during successive sharpenings. Probably the greatest error arising in the sharpening process is caused by cutter runout. Cutter runout in mounting for the grinding process may occur in a number of ways: (1) parallel runout, where the cutter axis runs eccentric to the arbor axis but parallel to it; (2) double end runout where both ends of the cutter axis run eccentric to the arbor axis but not parallel to it; (3) single end runout where either one of the ends of the cutter may run eccentric to the arbor axis.

Where parallel runout occurs in sharpening, the finished cutter will have unequally spaced flutes with a resultant diameter runout. This creates unequal heights in the various cutting teeth which, in operation, cause a continuously changing tooth form and an appearance of poor finish. The cutting teeth will not wear equally and the highest tooth will necessarily carry the greatest load. Runout of this nature is usually caused by defective spacing collars on the grinding arbor; however, a sprung arbor or an oversize bore in the mill may also cause the same characteristic. The only sure remedy for this problem is to set up and check thoroughly with a dial indicator both the arbor and the mill.

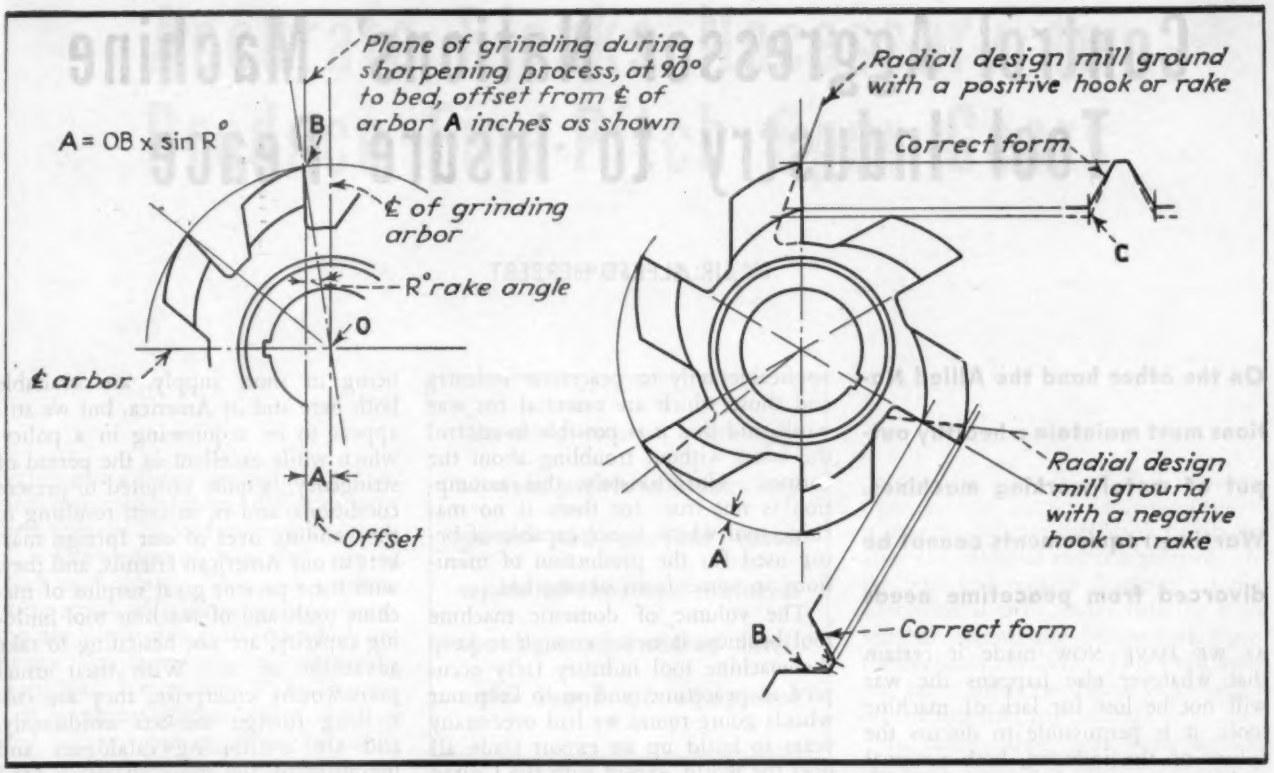
It will be found that arbors and collars correctly handled and stored will cause little difficulty in setting up for grinding. However, mutilated equipment will cause continuous misalignment troubles, especially in any case where the bore of the mill is slightly too large. Should the clamping nut have a mutilated face, the locking action along with non-parallel collars will spring a long arbor easily, producing a double end runout on the mill. Grinding a mill under such conditions will cause unequal flute spacing with resultant unequal tooth heights and diameter runout. Here, though, the runout and tooth height along any flute is continuously varying from maximum at the ends to minimum at the center of the mill. Threads milled with such a cutter will often show a considerably varying pitch diameter from end to end of the thread. The finish of the milled threads is not unlike that found in parallel runout and finished tooth form is poorer.

Where the grinding arbor used is short and stiff at the machine end, a mutilated clamping nut or collar will produce a third condition, or single end runout. Here the end at the clamping nut usually is in error. The stiff end of the arbor at the grinding machine head will, as a rule, hold the mill true, or nearly so, at that end. End runout is often caused by a defective outboard bearing or tailcenter. In the process of mounting a large mill of considerable weight, the arbor may bend sufficiently so that after clamping, the outboard bearing center will not bring the arbor back into alignment. Here the diameter runout starts at zero and gradually increases to a maximum at the outboard end. This may produce a distinctly tapered pitch diameter in the finished thread. Finish and form of the milled thread is again poor in this case and the resultant milled threads are no better in quality than those produced with an unground cutter with its distortion.

Second, but equally as important as cutter runout errors, are errors introduced by failing to exactly duplicate the original lead of the flute, whether straight or helical. Error in lead of the flute results in a tapered mill, the diameter of one end becoming smaller than that of the other. If the individual teeth of each flute are ground in a plane other than that for which the form was designed, the thread lead and form change from one end of the cutter to the other. Incorrect flute lead is often caused by inexperienced operators who, in the sharpening process, force the grinding wheel by too heavy a cut, fail to dress the wheel properly, or fail to "spark out" completely all the gashes. Forcing with a heavy cut causes a wheel to grind considerably more on the run in and out, and where the wheel is loaded heavily across the center section, the cut is light. This produces a distinctly curved face on the gash and a taper from each end to the center.

A thread milled with such error in the cutter usually will not conform to gaging specification; however, many times considerable pieces may be run before such error is found. Therefore, it is considered a must to check for these errors during the sharpening process to make certain that the work is true to specifications.

Also of prime importance is the equal spacing of the cutting faces. Owing to the cam relief or back-off design of the teeth, unequal spacings will produce high and low teeth in the mill, with some teeth doing most of the cutting. These teeth will not follow each other in the exact relationship intended, and, like a mill with runout, will produce a poor finish. Worn


Plane of grinding during sharpening process, at 90° to bed, offset from ℄ of arbor A inches as shown
A = OB x sin R°
B
℄ of grinding arbor
R° rake angle
O
℄ arbor
A
Offset
Radial design mill ground with a positive hook or rake
Correct form
C
Radial design mill ground with a negative hook or rake
A
B
Correct form

Left—For maximum accuracy in maintaining proper rake angle, offset *A* must be corrected to suit radius *B*, which diminishes with each sharpening, because of cam relief of the tooth. *Right*—Grinding errors have varying effect upon multiple thread milling cutters, such as unequal tooth height, *A*, from unequal spacing, and, incorrect thread forms, *B* and *C*, from rake error in grinding

index plates, or the failure to use one, worn machine parts, mishandling of the grinding wheel, or misalignment in the grinding machine will produce this condition. Should a cutter be ground without the use of an automatic feed device, the operator must be extremely careful to "spark out" each flute sufficiently to assure removal of exactly the same amount of stock.

Tooth rake must be exactly maintained during the grinding or sharpening process, since the tooth form has been designed for the rake specified, and any deviation will produce a faulty tooth form. Should a radial cutter be ground with a positive rake, the resultant tooth form will be too deep and the thread form angle too small, and vice versa. Deviations in rake have been found to produce milled threads with apparently correct pitch diameters, but which fail to fit the mating thread. This is caused by the change in form angle of the threads. Grinding wheel positions must be carefully checked to assure correct rake. Failure to set the wheel dressing diamond to the positive stop position and bring the wheel into the diamond for dressing will result in a continuously changing rake angle on any cutter. The diamond stop position and the method for setting to positive or negative rakes must be carefully followed to assure high accuracy.

In order to attain the maximum accuracy in this very exacting grinding process, it is of great importance that proper equipment be used to do the work. Automatic grinding with the cone side of the abrasive wheel is of prime importance in maintaining a uniform line contact, constant area and very nearly uniform pressure during the passage of the wheel, especially where helical gashes are used. The index method of spacing the flutes is also important. An accurate mechanism for reproducing the spiral lead is likewise important. Lastly, it must be stressed that the operator in the grinding process know his machine and grinding wheels. Heavy wheel feeds are not favored unless coolant is used. The heat created during the grinding cycle at the moment of contact may be as high as 1400 to 1500 F. This may draw the temper from the cutting edges of the teeth and reduce the life between grinds 50 to 75 percent. Tests have proven that cutters sharpened with a properly dressed wheel producing a fine smooth edge on the teeth may increase the production between grinds as much as 10 times. Generally 0.005 in. to 0.010 in. maximum stock removal to sharpen a cutter is considered most economical depending on the thread profile accuracy desired in full-scale production.

In order to make this care and control in the grinding process effective, the work must be carried on by the production department. The primary requisite of good operation is careful set-up. Here, as in the grinding process, use of the dial indicator will obviate runout troubles. Failure to indicate both ends of the cutter at set-up will often give rise to severe runout at either or both ends. Poor spacer collars, mutilated locking nuts, mishandled arbors, worn machine parts, or dirty conditions are some of the contributing factors. Runout in operation creates the same inaccuracies in the milled threads as do runout errors in grinding. One is equally as bad as the other. For this reason most manufacturers recommend the mill have an indicating hub on each side specially ground true with the original cutting teeth. Individual check of each end will often reveal unsuspected contributing conditions.

For large scale production of accurate parts, a good practice is to determine the number of parts that can be safely milled within the limits allowed before the cutter is severely dulled. Once this schedule is determined, strict adherence will make possible maximum production and cutter life with optimum grinding requirements.

Control Aggressor Nations' Machine Tool Industry to Insure Peace

BY SIR ALFRED HERBERT

On the other hand the Allied Nations must maintain a healthy output of metal-working machines. Wartime requirements cannot be divorced from peacetime needs

AS WE HAVE NOW made it certain that whatever else happens the war will not be lost for lack of machine tools, it is permissible to discuss the future of the industry, both national and international. It may be said with perfect confidence that he who controls the world's machine tools controls the world.

If, therefore, we can control the machine tool industry of the aggressor nations, we need not trouble to control anything else. If the framers of the Treaty of Versailles had realized this and had dealt with the problem, they need not have concerned themselves very seriously about the rest of the treaty, for the present war would never have broken out. Clearly, therefore, the aggressor nations must not be permitted to have a machine tool industry of serious importance after this war. If we were asleep regarding the importance of machine tools, Hitler was very fully awake, and he built up his machine tool industry until Germany became the largest producer, except the United States. Thus he insured continuous expansion, and built up a great force of skilled workers. But while the machine tool industry of the aggressors should be drastically controlled, it is equally important that the machine tool makers of the Allied Nations (and particularly Great Britain) should flourish. For this country holds, and will continue to hold, the front-line position in Europe. Not only must we be normally strong, but we must be in a position rapidly to increase our strength in an emergency.

From the less well informed we hear the suggestion that machine tools may be divided into those which are applicable only to peacetime industry and those which are essential for war work, and that it is possible to control the latter without troubling about the former. Unfortunately, this assumption is not true, for there is no machine tool which is not capable of being used for the production of munitions in some form or another.

The volume of domestic machine tool business is never enough to keep the machine tool industry fully occupied in peacetime, and so to keep our wheels going round we had over many years to build up an export trade all over the world, except with the United States, whose tariffs have always kept us outside the fence.

Foreign Connections Severed

War conditions have made it impossible for us to maintain our foreign connections, for they had to be sacrificed to the needs of our own services and to those of our Dominions and Allies. Our foreign establishments in enemy, or enemy-occupied, countries have been seized, while our selling organizations in neutral countries have been unable to receive supplies from us, and consequently they have lost their grip on their markets.

Our American friends came nobly to the aid of this country and supplied us with large numbers of machines on lend-lease, and also sent supplies to Russia.

During the period when the demand for machine tools far exceeded the available supplies, the requirements of our overseas friends were very properly submitted to joint consultative bodies, who decided whether these demands should be met from British or American resources, and as shipping was then the main difficulty, American machine tools were almost invariably chosen, if transport from that country was easier than from Britain. As a result, the Canadian demand was filled almost exclusively from America, and to a large extent the same may be said about India, Australia, South Africa, and New Zealand.

Now the position has completely changed. Machine tools, instead of being in short supply, are available both here and in America, but we still appear to be acquiescing in a policy, which while excellent in the period of stringency, is quite unsuited to present conditions, and is, in fact, resulting in the handing over of our foreign markets to our American friends, and they, with their present great surplus of machine tools and of machine tool building capacity, are not hesitating to take advantage of it. With their usual praiseworthy enterprise, they are cultivating foreign markets assiduously, and are distributing catalogues and literature of the most attractive kind and joyfully allowing their industries to accept all the orders that are offered to them. They have already given our Russian Allies very large dollar credits to be used, among other things, for the purchase of American machines. As usual, we appear to be asleep, and we shall shortly awake, when it is too late, to find that our former overseas markets, which are vital to us, have been appropriated by America.

Abstracted from The Engineer (London)

New Names Needed

NAMES which are suitable when they are adopted are frequently outmoded by new developments. When new steels were found that were far superior to the carbon and musket steels which preceded them, it was perfectly natural to call them high-speed steels. But with the coming of Stellite and the carbides, the term "high-speed" becomes a misnomer. For while neither Stellite nor carbides are steels in the usual sense, they are more high-speed cutting tools than the others, as they cut at many times the speed.

As a common name for high speed steel is the numbers showing the proportions of tungsten, chromium and vanadium such as 18-4-1, it might be well to designate them in that way. Then all would know exactly what was meant and we would not refer to a tool as "high-speed" when other tools were being run at from five to twenty times their cutting speed.

Accurate Blanks Necessary to Produce Fine-Pitch Spur Gears

BY CHARLES BULLEN

Checking some seemingly obvious points in blanks and gears can prevent much waste of time and material spent in assembling intricate types of equipment

TODAY many shops are handling fine-pitch gears and having difficulty with them because of inexperience and lack of a knowledge of how and why to check such gears. This and a subsequent article will discuss ways of checking fine-pitch spur gears, on which accuracy demands are not extremely high, with a minimum of equipment.

It is almost impossible to check a gear for any one condition by itself. Since tests involve a combination of two or more conditions it is necessary to know which is the more important and try to interpret results accordingly. Many difficulties encountered in trying to cut gears accurately could be avoided by a slight change in design. Gear blanks have been found that could not be held for cutting until a change had been permitted. In general, thin irregular sections, small hubs and small bores should be avoided on large diameter gears.

It is practically impossible to produce accurate gears from inaccurate blanks, chiefly because of methods used to hold blanks while cutting. Certain inaccuracies in the blank will be reflected in the finished gear, and the ultimate accuracy of the gear should be understood by the blank maker. Gear drawings seldom show how accurate the blank must be, but it would be helpful to show on all drawings what tolerances are necessary on the blank. Such tolerances should be based on the requirements of the gear and the method of holding the blank.

Bore May Be Out of Square

Some methods of producing gear blanks from bar stock or forgings leave the bore out of square with the flange. This is especially true if the hole is drilled and reamed and the blanks finished from the bar at one setting. Since blanks are generally clamped on the gear cutter mandrel by a nut, it follows that if the sides of the blank are not parallel, or if they are parallel but not at right angles to the bore, the effect of tightening the nut will be to spring the mandrel out of true, resulting in inaccurate cutting.

Two important checks should be made on the blanks. First, for parallelism and, second, for squareness of sides with the bore. Lack of squareness shows up as side wobble or runout, and the bigger the diameter, the more pronounced the wobble is likely to be. In some cases a slight amount of side wobble is not objectionable in the finished gear, but it generally indicates the gear has not been accurately cut.

Side finishing usually should be done with the blank pressed on a mandrel and turned between centers, or on a short stud held in the chuck and turned to the correct diameter.

Blanks known to have been finished from bar stock in a screw machine should be given a 100 percent check for runout. The importance of this check can be seen when it is realized that even an accurate blank mounted for cutting along with one having wobble will result in both being cut inaccurately. Even though two blanks with wobble are mounted back to back so that both high points are in contact, tightening the mandrel nut may result in considerable bending of the mandrel.

From the gear cutter's point of view, it is always an advantage to have the outside diameter of the gear concentric with the bore. The mandrel of the gear cutting machine is constantly checked for runout and if it indicates true and the blanks are concentric it is easy to indicate the blank or blanks after the mandrel nut is tightened. If the bore and outside diameter are not concentric it is necessary that the high spot of eccentricity be marked when the blank is checked. This must read the same when the blank is mounted on the mandrel for cutting.

In the finished gear some outside diameter runout is permissible, since it does not affect the operation. At the highest point of runout, the addendum will be longer than standard and this extra length should be checked against the normal clearance to make sure no bottoming can take place against the corresponding tooth space in the mating gear.

Some gear cutting shops find it takes no more time to take a cut on the O. D., making the blank concentric, than it does to indicate the blank and mark the high spot. Then, when the blanks are set up for cutting, any indicated amount of runout will show that the mandrel is running out.

Teeth Should Be Clean

Gear teeth must be absolutely clean when being checked, for many rejections due to runout have been traced to burrs on teeth. In fine-pitch gears the burrs are small and are often pushed back into the tooth space, but not broken loose. Their removal requires considerable skill, and unless done with great care the burring operation can cause damage to the gear. This is particularly true when burring is done with a rotating wire brush. Such an operation actually can swell the ends of small teeth, and, if not discovered, can completely ruin the otherwise smooth running of any mechanism into which they are assembled. This condition can be felt when the gears are meshed at proper center distance and rotated by hand. It can be seen with a magnifying glass.

Before inspecting gears they should

be cleaned thoroughly. Loose burrs can be removed with a hand brush having fine brass bristles.

Excessive burrs can be traced to dull cutters or too coarse a feed. They can sometimes be kept to a minimum by cutting several gears clamped close together. Only the last gear will show a burr of any appreciable size.

It is recommended that a 100 percent check be made on fine-pitch spur gears, especially on those having a large number of teeth. Such a check may seem unnecessary, but experience has shown that much time, labor and material are wasted because gears with too few or too many teeth have been put into complicated mechanisms.

Teeth Count Easily Checked

One gear out of a given quantity should be carefully checked and rechecked for tooth count, perhaps by two different inspectors. One tooth is marked with a pencil or marking fluid. The remainder of the gears can be checked against this gear by marking a tooth space on each one. This space is then meshed with the marked tooth in the reference gear and the two rotated one revolution, with both gears lying on a flat surface or on two pins correctly spaced. The marked tooth and tooth space should coincide after the revolution.

The finding of only one gear cut with an incorrect number of teeth out of a quantity all cut on the same machine with the same set-up need not be surprising even if all were cut at one time. Such a result is seldom due to the indexing of the gear cutting machine, but is generally due to the blank slipping on its mandrel at the start of the cutting operation. To prevent bending of the mandrel, operators usually pull the nut fully tight after the outer supporting center is in place. If this final tightening is omitted, slippage can occur.

At first thought it would seem that one tooth too many would result in all teeth being much thinner at the pitch line. A simple calculation will show that the difference can be extremely small in each tooth.

Assume a 48-pitch gear, with 96 teeth, in which the following is true:

Tooth thickness on pitch line ..... 0.0327 in.

Circular pitch ..... 0.0654 in.

For 96 teeth, pitch diameter ..... 2.0000 in.

Pitch diameter circumference ..... $2 \times 3.1416 = 6.2832$

Tooth thickness should equal tooth space along pitch line:

Thickness of tooth is $\frac{96 \times 2}{6.2832}$ for 96 teeth.

This equals 0.0327 in. or standard tooth width for 48 pitch. Suppose that one extra tooth is cut in the same pitch diameter, then it becomes $\frac{6.2832}{97 \times 2}$ for 97 teeth. This equals 0.0323 in., so the difference in tooth thickness is only 0.0004 in. less in width for 97 than for 96 teeth.

Stated differently, it is the difference between $\frac{1}{96 \times 2}$ and $\frac{1}{97 \times 2}$ of the pitch circle. It is quite evident that this small difference cannot easily be detected. The gear even would fit into place in a fixed center distance and the additional backlash be hardly noticeable.

A second and concluding article on checking fine-pitch spur gears will appear in an early number.

After one gear has been carefully checked for the number of teeth, it is a simple matter to check any number of gears by marking one tooth on the master, and a tooth space on the gear to be checked. Starting with the marks together, the gears are rotated and after one revolution the marks should assume the same relationship

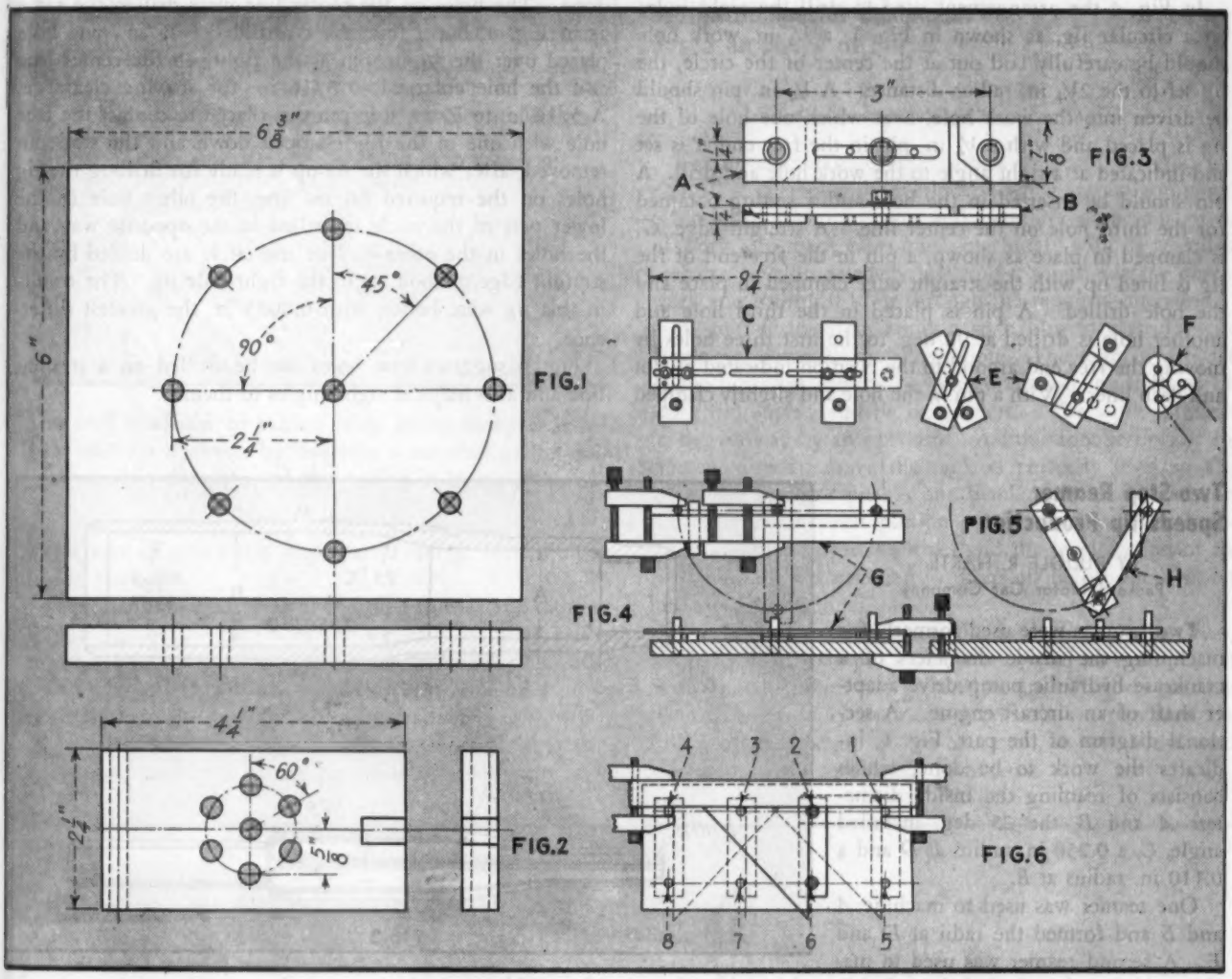
Modified Whitworth Threads

ONE of the early headaches of American machine builders with orders from Great Britain was the specification calling for Whitworth threads. In these days of highly stressed parts, such as in airplane engine building, we all know the advantages of threads having a rounded bottom. One of the reasons for the adoption of the American Standard thread form (formerly known as the Sellers or Franklin Institute thread) was the elimination of th sharp 60-deg. groove at the bottom of the thread. The American thread replaces this with two obtuse angles, and is a great improvement. But even this is not as strong as the rounded surface of the Whitworth.

Early in the war, in 1940, the British began to accept threads which were flat on top but rounded at the bottom. Now, as the result of conferences on both sides of the water, they are accepting threads with flats at both top and bottom, for use in many places. This has become practically an American form of thread, except for the angle of 55 deg. instead of 60 deg. Complete tables with tolerances are now available at the American Standards Association and should be studied by those making threaded parts for the British.

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



Multiple points for drilling holes on radii, or in angular relation to each other and which require close tolerances, are located accurately by means of a master jig, which can be easily assembled

A Handy Master Jig for Flat Jobs

BY BEN FRANTZGREB

A simplified master jig that can be assembled easily and which has been found to be a very useful tool on flat jobs was recently used for drilling eight 13/32 in. holes in a plate $\frac{1}{2} \times 6 \times 6\frac{3}{8}$ in., the holes being spaced equally on a $2\frac{1}{4}$ in. radius, as shown in Fig. 1.

In Fig. 2 is shown a smaller type of jig useful for small work, with a plate measuring $\frac{1}{2} \times 4\frac{1}{4} \times 2\frac{1}{4}$ in. in which six $\frac{1}{4}$ in. holes were drilled at a $\frac{5}{8}$ in. radius and 60 deg. apart and measuring $\frac{5}{8}$ in. from center to center.

In Fig. 3 is shown the jig and various ways in which it is used. *A* and *B* are two identical parts $\frac{1}{8} \times \frac{7}{8} \times 2\frac{7}{8}$ in. and on one end of each a $\frac{1}{8} \times \frac{7}{8} \times 2\frac{7}{8}$ in. block was riveted. In the center a 13/32 in. hole was drilled and reamed and a $\frac{1}{4}$ in. hardened bushing inserted. A slot to take a 10-32 screw was made in one part and three 10-32 holes tapped in the other. One corner of each square was cut away to allow closer adjustment, as shown in the drawing at the left of *E*. At the right of *E* is another arrangement convenient for a radius of less than the 3 in. distance

shown in *A* and *B*. At *C* there is an extension 9¼ in. long to allow for a 9 in. center adjustment if *B* is turned at a right angle as suggested by the dot and dash lines. By inserting ¼ in. pins in the bushings they are set to the desired micrometer measurement.

The method shown at *F* can be used when center distances are less than ⅝ in. by making up three bushings of the same size and tieing them together with a soft copper wire when six holes in a circle are required. If more than six are required only two bushings are needed.

In Fig. 4 the arrangement used to drill the eight holes on a circular jig, as shown in Fig. 1, a ¼ in. work hole should be carefully laid out at the center of the circle, the jig set to the 2¼ in. radius distance. A ¼ in. pin should be driven into the work hole, over which one hole of the jig is placed and with a ¼ in. pin in the free end it is set and indicated at a right angle to the work hole and drill. A pin should be inserted in the hole and a setting obtained for the third hole on the center line. A straight edge, *G*, is clamped in place as shown, a pin in the free end of the jig is lined up with the straight edge clamped in place and the hole drilled. A pin is placed in the third hole and another hole is drilled at 90 deg. to the first three holes by moving the free end around to the position indicated by dot and dash lines. With a pin in the hole and slightly clamped the micrometer is applied until the measurement over the lower pin is exactly in the center of the two jig holes of the line above. Two holes should then be drilled on the half circle at 45 deg., the same as the one at 90 deg. The other three holes are drilled by the straight edge method used on the center line until all eight holes are finished. The result was within the limit of plus or minus 0.005 in. One hole was plus 0.004 in. The holes were then enlarged to the 13/32 in. dimension.

Fig. 5 shows how the six holes in the jig of Fig. 2 were done. The holes on the center line were drilled the same as in Fig. 4, but a link, *H*, is drilled at ⅝ in., one hole placed over the ¼ in. pin at the right, on the center line and the hole enlarged to 5/16 in. for shaving clearance. A 5/16 in. to ¼ in. stop pin was placed to contact the free hole with one in the jig, clamped down and the stop pin removed, after which the set-up is ready for drilling the jig holes on the required 60 in. line, the other hole in the lower part of the circle is drilled in the opposite way and the holes in the other half of the circle are drilled by the straight edge method, as in the eight-hole jig. The results in this jig were better, with 0.0025 in. the greatest difference.

Fig. 6 suggests how holes can be drilled on a straight line and also holes at right angles to them.

Two-Step Reamer Speeds Up Production

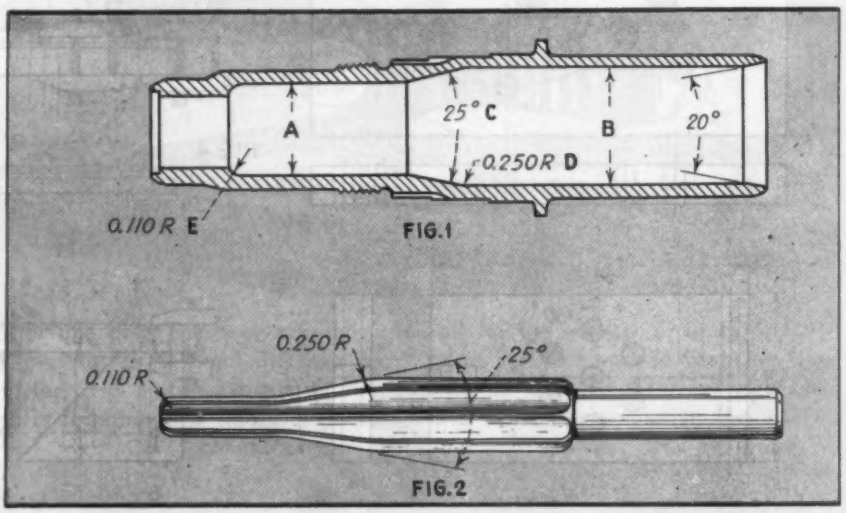
BY RUDOLF R. HARTL
Packard Motor Car Company

Two reamers were used formerly for machining the inside diameters of a crankcase hydraulic pump drive adapter shaft of an aircraft engine. A sectional diagram of the part, Fig. 1, indicates the work to be done, which consists of reaming the inside diameters *A* and *B*, the 25 deg. included angle, *C*, a 0.250 in. radius at *D* and a 0.110 in. radius at *E*.

One reamer was used to machine *A* and *B* and formed the radii at *D* and *E*. A second reamer was used to machine the 25 deg. included angle, *C*. Angle *C* could not be blended with the radius at *D*, however, necessitating a polishing operation.

In order to reduce the number of operations required on the part, the reamer shown in Fig. 2 was designed and it has not only made the use of the angle reamer unnecessary, but has also eliminated the polishing operation.

The elimination of the reaming operation has resulted in a 15 percent increase in the production rate, two men formerly required for polishing have been released for other work and the total savings in manhours is well over 5,700 a year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

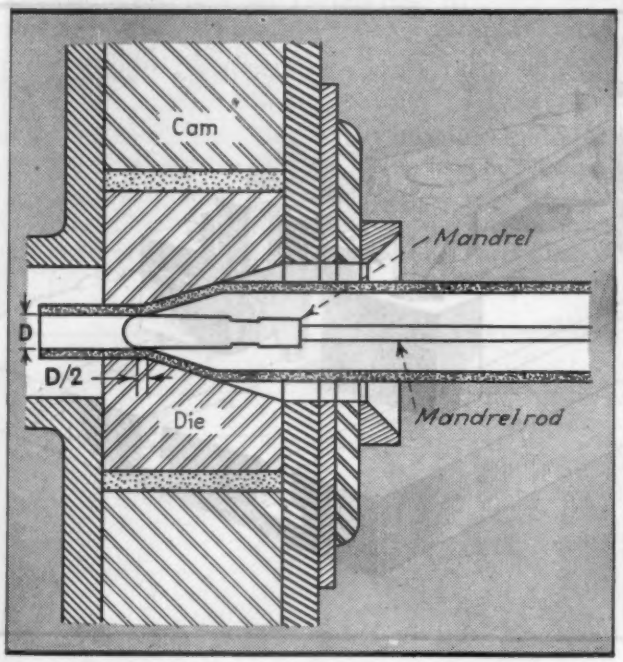


Two operations are accomplished with one reamer, instead of two, by designing a tool for machining two inside straight diameters, two radii and one included angle and also blending one angle and one radius, eliminating the necessity for polishing

Mandrel Maintains Uniform Thickness of Swaged Tubing Wall

BY CHARLES L. SCHRADER
Curtiss-Wright Corporation

In bending, or flaring, the swaged portion of a tube it was necessary to hold the wall to a uniform thickness which would be identical with the wall thickness of the rest of the tube. This was accomplished by using a mandrel, and



The wall thickness of tubing while being swaged is held to a uniform thickness by inserting a mandrel at the point where the diameter of the tubing is being reduced

a tolerance of plus 0.006 in. minus 0.000 in. is held on the inside diameter.

The mandrel is inserted in the tube so that approximately one-half of the length of the constant diameter section extends into the reduced section of the tube. The other half of the constant diameter section and remainder of the mandrel extends into the unreduced portion of the tube. The mandrel is held in place by a rod, which is supported at its outer end by a fixture placed at sufficient distance to insure clearance for the travel of the table. During the swaging operation the relative position of the mandrel remains fixed and stationary with respect to the die face and does not revolve with it.

The use of the mandrel does not affect the length of the reduced section. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

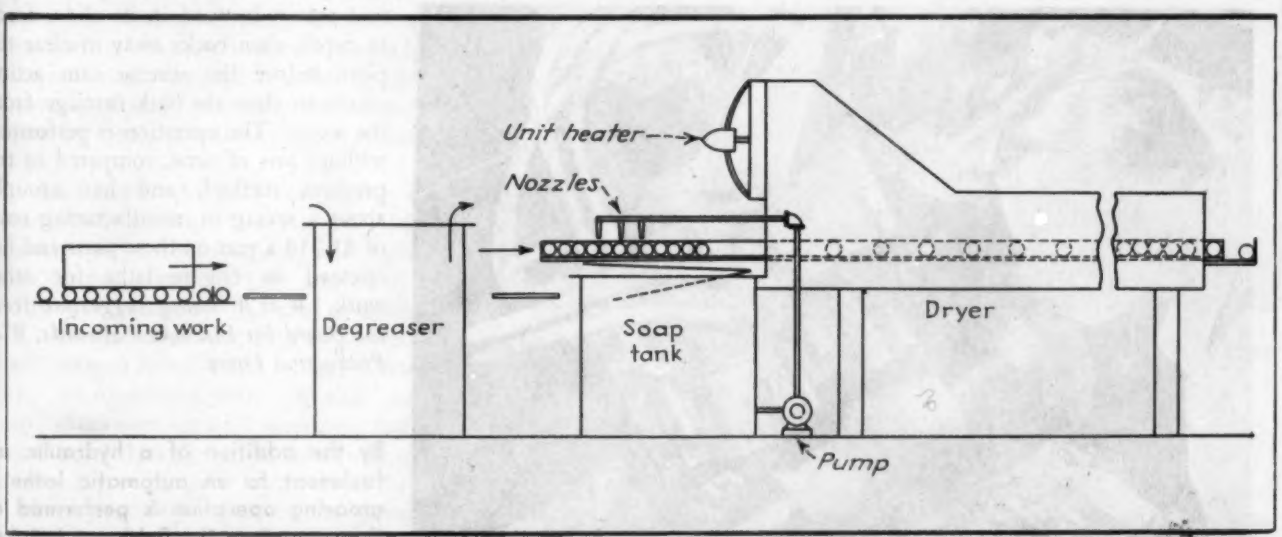
Design of Special Equipment Based on Shape of Parts

BY H. J. GURNEY
Gorham Manufacturing Company

Taking advantage of the natural shape of material is a point that is frequently overlooked when special equipment is designed for processing and handling numerous pieces of work. In many cases much machinery with its attendant cost can be eliminated by utilizing a round surface on the work and rolling it to or through the required operation.

A unit designed to apply a soap film to cartridge case blanks is shown in the illustration. The soap, which acts as the lubricant for the cupping operation, must cover the work thoroughly and be baked hard. The work is placed in the runway by an operator. A three-foot section of the runway directly above the tank is perfectly level so that when the operator pushes one blank in, it pushes another out onto the inclined portion of the runway. The liquid soap is pumped over the disks and the level section of the runway allows excess soap to drain off before the disk enters the drying tunnel.

The pitched runway carries the work through the drying tunnel, which is simply a unit heater with an extended enclosed hood. With the present set-up, two girls obtained approximately twice as much production as two men did in the original set-up of the operation, in which the work was soap dipped and baked in baskets.



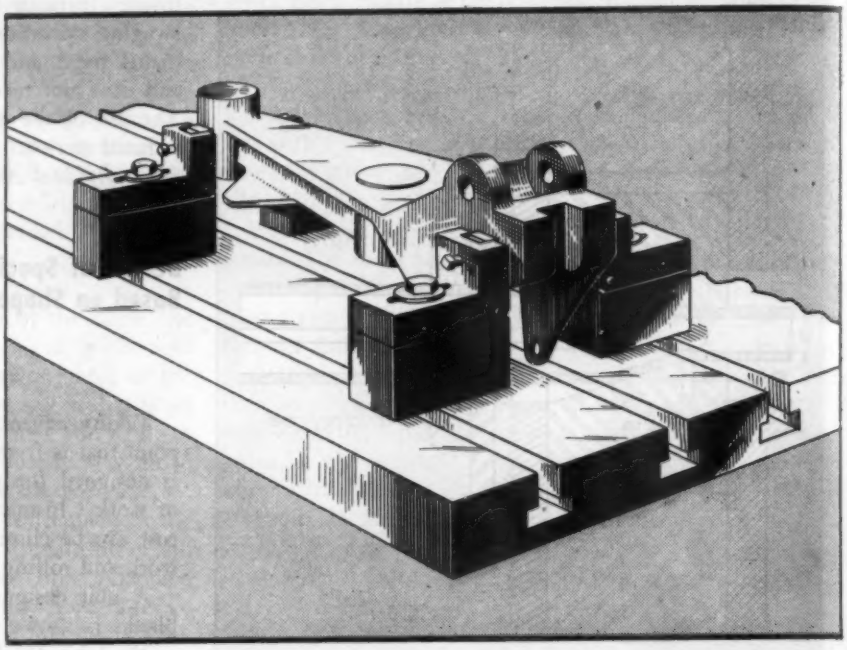
Cartridge case blanks are typical of many products which have rounded surfaces which can be rolled through an operation, thereby increasing production, if the equipment used is designed to take advantage of the natural shape of the parts

Holding Device for Small Runs of Odd-Shaped Parts

BY CHARLES E. STROTHER
Washington Navy Yard

A holding device for irregularly shaped parts, in effect a portion of a vise, can be used on occasional runs which do not warrant purchase or fabrication of expensive fixtures. It is assembled easily and has proved to be a satisfactory shop tool. The device has been used effectively on many milling machine operations and can be used on reciprocating machines of the planer type.

The base of the device is clamped to the bed, or platen, of a machine, or to a fixture. It is placed sufficiently close to the workpiece to permit the movable jaw to make contact with it by a small amount of adjustment of the actuating screw. If the operation is a continuous run on many parts they can be removed easily after machining by releasing the holding jaws.



The set-up time when milling odd-shaped parts, which must be held securely without causing stresses, has been greatly reduced by use of blocks and clamps which are adjustable to any desired height

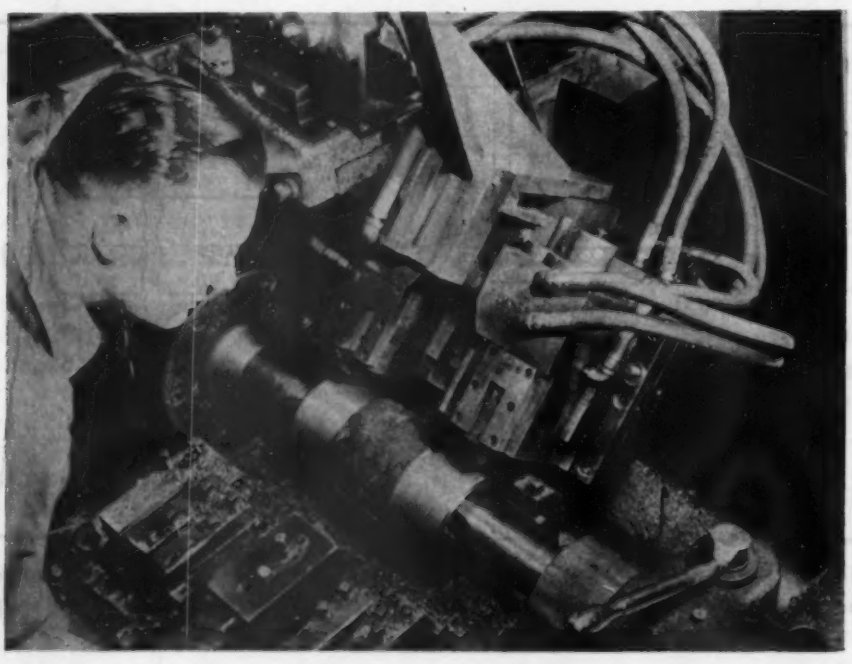
Auxiliary Toolslide Grooves Part While Finish Turning on Automatic

BY ROBERT F. ZIMBELMAN
Caterpillar Tractor Company

Track roller hubs were formerly grooved in a second operation on an engine lathe, but a change was made recently whereby this operation was transferred to the back carriage of an automatic lathe and the grooves are now formed during the final stage of the operation.

A toolslide for the grooving tool is built into the back carriage and is operated by a hydraulic cylinder. Sequence of operations is now as follows: The front carriage rough turns the O.D. of the roller hub, chamfers one end and backs away. The back carriage finish turns the O.D., forms the chamfer on the other end and counterbores. The grooving operation is so cammed and timed that during the dwell of the tools the hydraulic unit functions as follows:

The toolblock containing the form tool moves forward in its slide, feeds to depth, then backs away to clear the piece before the reverse cam action occurs to clear the back carriage from the work. The operation is performed without loss of time, compared to the previous method, and has brought about a saving in manufacturing costs of $5,750 a year on these parts and has released an engine lathe for other work. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



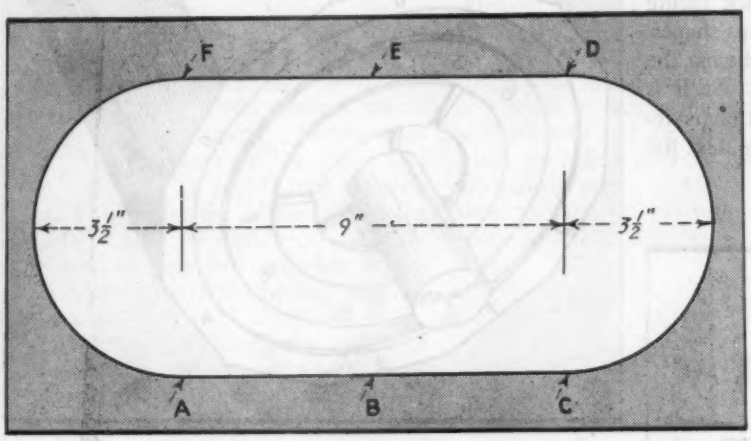
By the addition of a hydraulic attachment to an automatic lathe a grooving operation is performed at the same time the finish cut is taken on roller hub, eliminating the separate operation required previously to form the grooves

Change of Methods and Cutters Reduces Milling Time

BY ARTHUR MANES
Bryant Electric Company

In milling the perimeters of flat castings, which had two straight sides and rounded ends, 16 in. long by 7 in. wide across the flat, the parts were mounted in a fixture which could be shifted from center to center so that a continuous milling operation could be accomplished. The milling cut was started at *A* and continued along the flat edge *B* to point *C*. The workpiece was then shifted and the rounded end was milled to *D*, after which the piece was again shifted and the other straight edge milled from *D* to *F*. Another shift was made and the end milled to the starting point, *A*. These operations were repeated three times on each casting to get the proper finish cut, as heavier cuts caused chattering of the cutter.

In order to eliminate continual shifting of the workpiece, which consumed much time, the method of straddle milling the two sides, *B* and *E* to finish size at one cut was adopted. By means of a change of cutters, with rigid mounting, the same accuracy is maintained. The parts are then shifted to another milling machine, where the rounded ends are milled as before. The change resulted in a saving of 1,033 man hours on that line of work. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Four cutting operations and considerable set-up time were eliminated in milling oblong plate castings by the adoption of straddle milling and a change in the type of cutters used

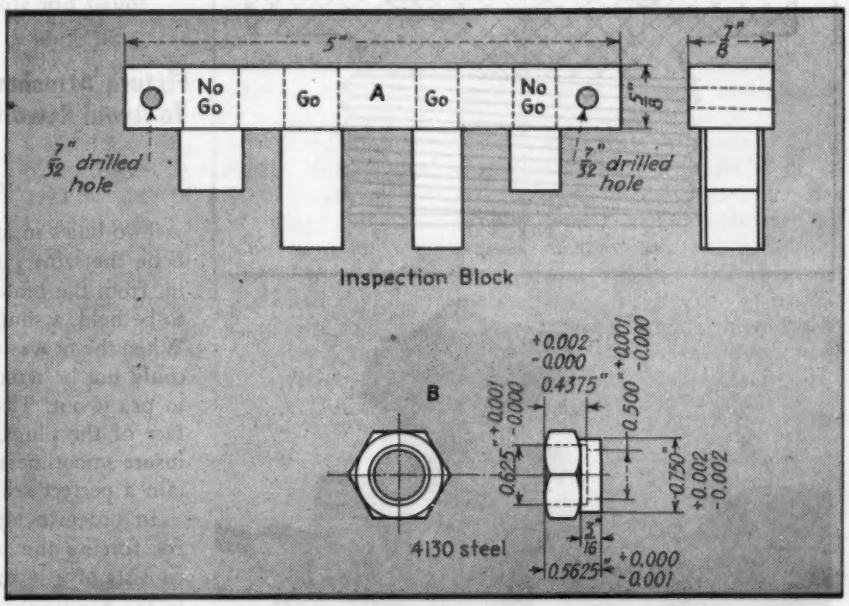
Four-Way Inspection Block Speeds Gaging of Small Parts

BY ROBERT MAWSON

One of the contributing factors in the growth of a "shoestring" machine shop to a medium-sized plant, working around the clock on defense work, has been the close attention given to possibility of improvement in manufacturing and particularly inspection methods whenever possible. One such improvement was that of doubling the number of small parts inspected at one time by means of a four-way inspection block.

This block was used for gaging a run of small parts which required 100 percent inspection. The over-all length of the part was 0.5625 in. and an ordinary dial indicator was used to check it. The part also contained two bored and reamed holes, 0.625 in. and 0.500 in. In most cases two "go" and "no go" gages were used for inspecting first one hole, then the other, which necessitated a reversal of the gages, or the part, laying down the gage, picking up the second gage and repeating the procedure for the second hole.

The layout of the four-way inspection block is shown at *A*, while the details of the part are shown at *B*. This tool was made of a block, in which were inserted the "go" and "no go" gages for both holes. The tool was fastened to a bench by means of screws through the holes shown at each end of the block. Using this tool an inspector can pick up two pieces to be tested, try out one hole with the gages at the right for one hole and the other size of hole in the other piece with the gages at the left-hand side of the block. The pieces are then transposed to opposite sides.



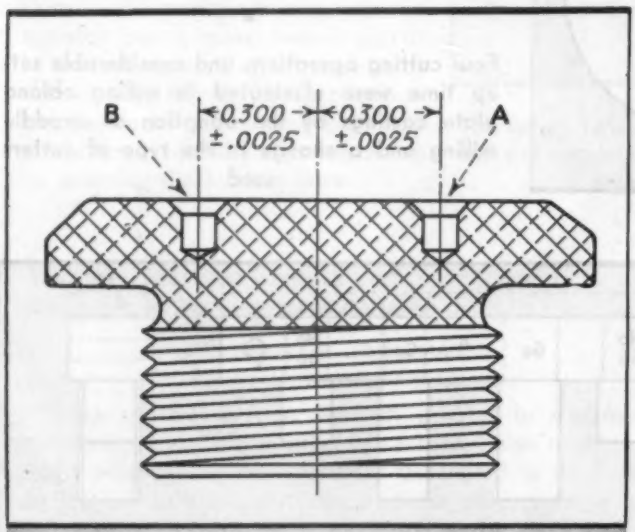
Material reduction in time required to gage holes in small parts has resulted from this simple gage arrangement

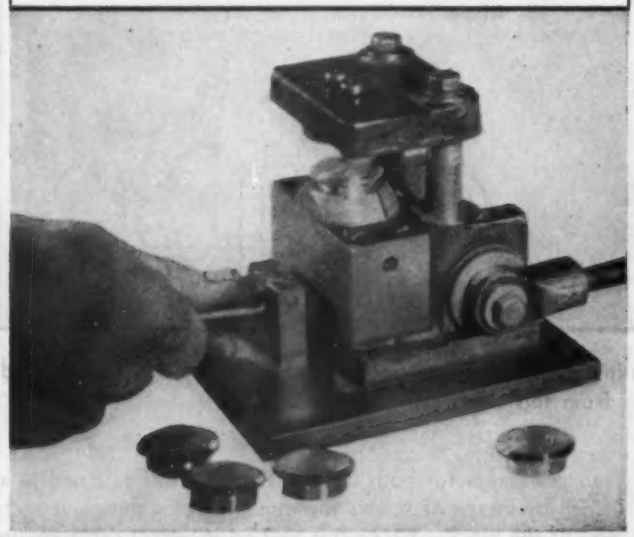
Fixture for Grinding Multi-sided Sections on Bar Stock

BY A. NICHOLSON
Westinghouse Electric & Manufacturing Company,
East Springfield, Mass.

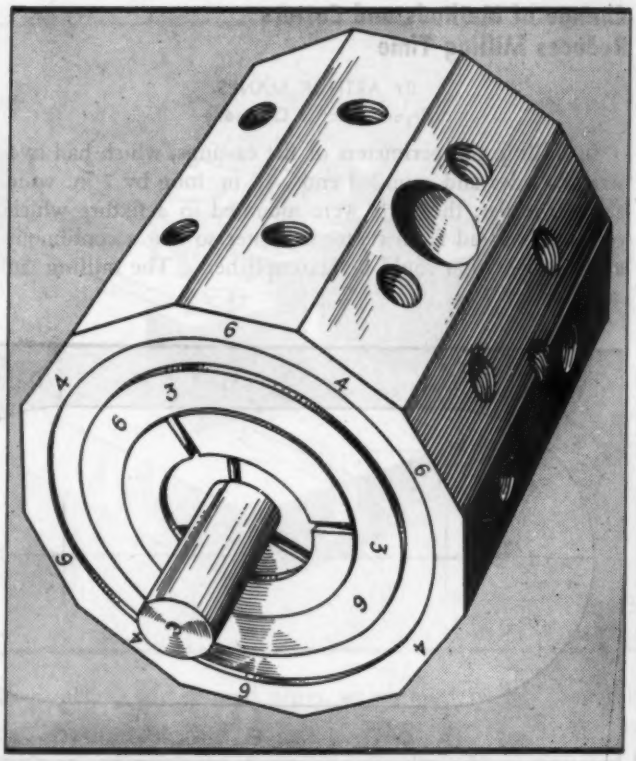
A chuck which has twelve sides provides a quick method of grinding triangular, square, pentagon and hexagon sections on round bar stock. The bar stock is held in a spring collet contained in the multi-sided chuck, which is hardened and ground.

The numbers stamped on the end of the chuck facing the flats are used as a guide in grinding the various shapes. If, for example, a six-sided shape is required on the bar the operator places the fixture on one of the faces which is numbered "6" and grinds the flat. This operation is repeated by turning the chuck over each time to the next flat marked "6" until all flats have been ground.





Engine core plugs which were formerly pried out of drill fixtures with screwdrivers were frequently damaged. They are now removed by a handle-piston arrangement, which eliminates damage and reworking



Three, four, five or six-sided sections are ground on round bar stock by means of an adjustable chuck

Fixture Attachment Removes Parts Without Marring To Avoid Reworking

BY PATRICK MICHAEL
Packard Motor Car Company

Two holes in an engine core plug were drilled at *A* and *B* on the same plane, plus or minus 0.0025 in., and 0.300 in. from the center of the part. Because of the close limits to be held, a snug fit in the holder, or fixture, is necessary. When the fit was too snug, as frequently happened, the plug could not be removed by hand and a screwdriver was used to pry it out. This method of removal often damaged the face of the plugs, making reworking necessary in order to insure smoothness of surface, as the plug was used to maintain a perfect seal under high pressure.

In order to eliminate damage and reworking, a means for forcing the plug out of the fixture was designed. It consists of a lever and plunger. When pressure is applied to the handle the piston is moved upward against the body of the plug, which is forced upward and out of the fixture, without damage to any of its surfaces.

With the old fixture three operators and three machines were required to produce 2,600 plugs a day. The same number of parts is now produced by two operators and two machines, and one operator and one machine have been released for other work and the time formerly required for reworking damaged parts has been eliminated. The total saving in man-hours is over 3,000 a year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Selection and Application of SINGLE-POINT TOOLS

TO OBTAIN maximum production from cutting tools, several points should be kept in mind. Among them are: (1) selection of the right tool for the job, (2) proper tool sharpening, (3) proper use of the tool in the machine, and (4) having enough tools on hand so there will be no loss of machine time for resharpening and replacement.

Efficiency of a cutting tool should be measured by the rate at which it removes metal, at the same time standing up under the strain of the cut sufficiently long to give economical life between grinds.

Best results are obtained when the machine is sufficiently powerful, rigid and accurate to withstand cutting strains and support the tool without vibration. Rigid mounting is essential to single-point tools. The tool should be large enough to absorb cutting forces without deflection, and overhang must be held at a minimum. Tool life is reduced greatly by not keeping tools on center with the work axis, so the use of tool setting devices can contribute materially to increased output.

The shape of the cutting edge of a single-point tool usually is determined as a result of compromises which give as much rake and clearance as possible while providing necessary support for the cutting edge. Under some conditions average lip pressure may range from 50,000 to 400,000 lb. per sq. in., depending upon the metal being cut, rate of feed, depth of cut and cutting angle of the tool. Pressures on cutting surfaces and severe rubbing actions may cause temperatures in the tool's nose to rise as high as 1,000 F. or more.

STANDARDIZATION OF TOOLS

Major economies can be effected by standardizing designs and sizes of single-point tools used in any shop. This is true whether the cutting tool materials are high-speed steel, cast non-ferrous alloy, cemented carbide or diamond. Savings are realized through reduced tool inventories, lower tool costs because of higher quantities involved, and reduced design requirements. Benefits derived from a standardization program are equally important in large and small shops.

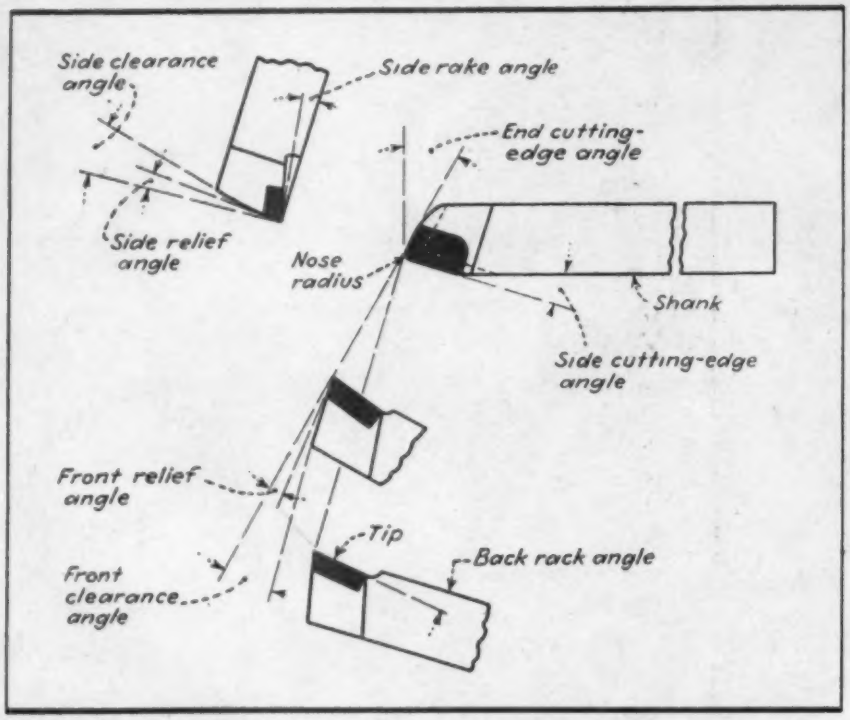
To set up tool standards, the first step is to prepare a complete record of tools being used in the shop. Next, operations should be analyzed to learn how many jobs could be performed with each type tool.

Tools selected as plant standards are usually simple in shape and generally there will be only 15 to 20 such tools needed, excepting variations in grades and shank sizes. Inventories of special tools can be reduced to one day's supply, if the standard tools have been chosen so they can be reground to form some of the more frequently used specials.

One aircraft engine manufacturer found that standardization of single-point high-speed steel tools results in

This special section was made possible through information obtained from the following sources:

Adamant Tool Company
Armstrong Bros. Tool Company
Bethlehem Steel Company
Carboloy Company
Carborundum Company
W. R. Chapin Company
Cooper-Bessemer Corporation
Crucible Steel Co. of America
Farrel-Birmingham Company
General Motors Corporation
General Tool & Die Company
Genessee Tool Company
Gorham Tool Company
Handy & Harman
Haynes Stellite Company
Kennametal Incorporated
Lovejoy Tool Company
J. Milton Luers
Mechanite Research Institute of America
Metro Tool and Gage Company
Norton Company
O K Tool Company
Pratt & Whitney, Div. Niles-Bement-Pond
Ready Tool Company
William Sellers & Company
J. K. Smit & Sons
Socony-Vacuum Oil Company
Super Tool Company
Tungsten Carbide Tool Company
Vascoloy-Ramet Corporation
Weddell Tools, Incorporated
Weldon Tool Company
Wendt-Sonis Company
Westinghouse Electric & Mfg. Company
J. H. Williams & Company
Wright Aeronautical Corporation



Accepted nomenclature for principal elements of a single-point tool are shown above. These terms are used throughout this discussion

CUTTING ANGLES FOR HIGH-SPEED STEEL TOOLS

SAE Number	Back Rake	Side Rake	Side Relief	Front Relief
1020	16½	14	12	8
X-1020	16½	14	12	8
1035	16½	14	12	8
1040	16½	14	12	8
1045	12	14	10	8
1095	8	12	10	8
1112	16½	22	12	8
X-1112	16½	22	12	8
1120	16½	18	12	8
X-1314	16½	22	12	8
X-1315	16½	22	12	8
X-1335	16½	18	12	8
T-1335	12	14	10	8
2315	12	14	10	8
2320	12	14	10	8
2330	12	14	10	8
2335‡	12	14	10	8
2340‡‡	10	12	10	8
2345‡‡	10	12	10	8
2350‡‡	10	12	10	8
3115	12	14	10	8
3120	12	14	10	8
3130	10	12	10	8
3135‡	10	12	10	8
3140‡‡	10	12	10	8
3250‡‡	8	12	10	8
4140	12	14	10	8
4615	16½	14	12	8
6140‡	10	12	10	8
6150‡‡	8	12	10	8

‡Tool angles will vary with the condition or heat-treatment of the steel, etc.

‡‡ Tool angles shown are for annealed material.

savings because of: (1) simplified grinding, (2) lower inventories, (3) simplified requisitioning, (4) faster tooling-up for new jobs, (5) interchangeable use of standard tools, (6) maximum tool economy. This same plant has established a line of standard carbide-tipped single-point tools. Four grade specifications have been established for machining steel and four for cutting non-ferrous materials. In each case, the four grades are specified as follows: (1) majority of roughing and finishing operations, (2) light finishing cuts where ability to hold size is important, (3) intermittent cuts, and, (4) precision boring.

In standardizing high-speed tools, this company has held tool shank sizes to a minimum, using seven for turning and facing, six for boring, and five for chamfering. Nose radii are limited to seven values between 0.030 and 0.250 in. Seven standard stock styles of carbide-tipped tools are purchased to make approximately 26 tool styles.

CUTTING TOOL MATERIALS

The wide variety of cutting-tool materials available makes it possible to select one having the best combination of properties for a given job or class of work. Selection of a material must take into account the operation to be performed, machine to be used, nature and condition of material to be machined, production requirements, accuracy required, quality or finish to be produced, and other service requirements. Characteristics to be compared include hardness and resistance to abrasion at cutting temperature, cutting ability, toughness, hardening characteristics, machinability, cost and availability.

The cutting tool selected for a given application must be harder than the material to be cut, both at room temperature and at the considerably higher temperatures reached during the cutting operation.

Before the development of high-speed steel, machinists used Mushet steels, carbon steels and sometimes extremely hard chill-cast white iron for cutting tools. Of these, only the carbon steels are used today.

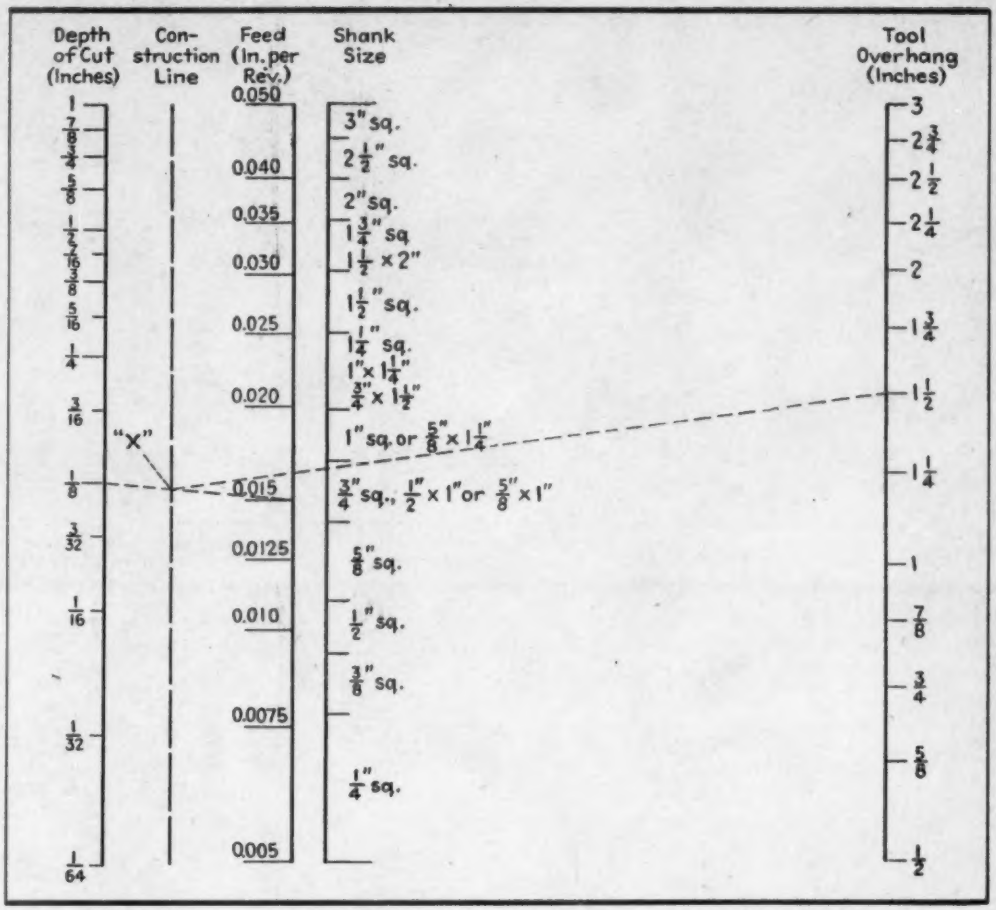
CARBON TOOL STEELS

Straight carbon tool steels, with 0.90 to 1.30 percent carbon and without appreciable additions of alloying elements, are the oldest metal-cutting tool materials in use. They are suitable for light finishing cuts, since they are strong, tough and resist abrasion. Carbon steel tools can be sharpened to a keen cutting edge. Such tools lose their hardness at 400 to 500 F., so they cannot be used for heavy cuts unless flooded with a cutting fluid having good cooling properties. Frequently, carbon tool steels are used to make special tools, such as form tools, where only a few parts are to be machined and the cost of high-speed tools could not be justified. Generally, carbon tool steels are used at relatively low speeds, in the range of 20 to 30 ft. per min.

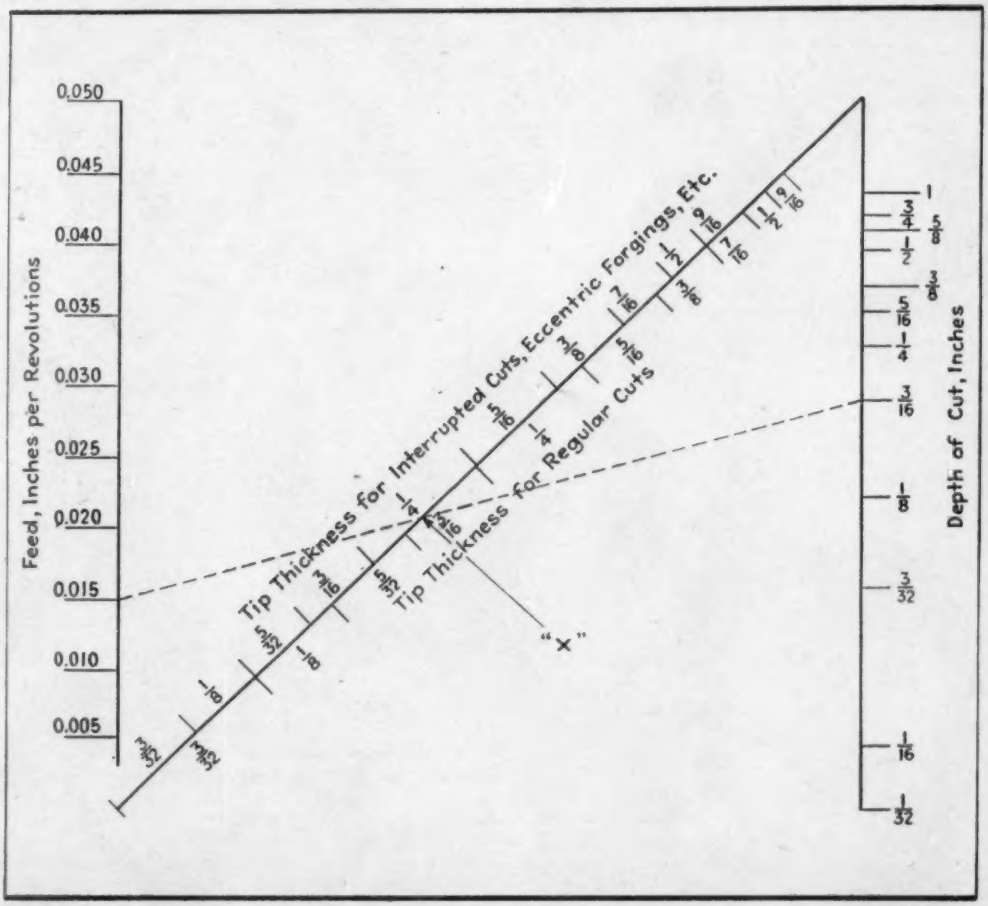
FINISHING STEELS

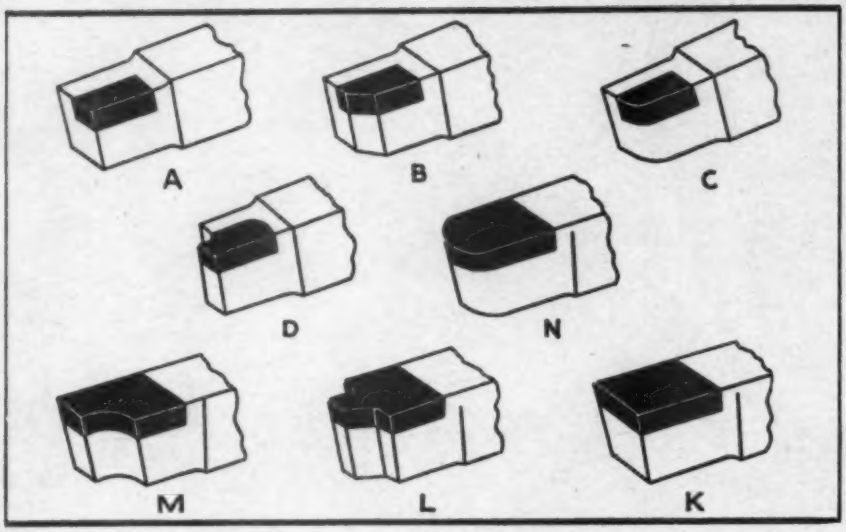
Steels similar in composition to carbon tool steels but having small percentages of tungsten, chromium or vanadium are known as fast finishing steels. They are suitable for finishing cuts because they can be heat-treated

Best shank size for a given condition of feed, depth of cut and amount of tool overhang can be determined with this alignment chart for a carbide-tipped tool made by brazing a carbide tip onto a mild steel shank. To use the chart, lay a straight edge between the proper points on the depth of cut and the feed scaled and mark the point X where it crosses the construction line. Then join point X with a point on the tool overhang scale. The point where this second line crosses the shank size scale determines the recommended shank size



Safe tip thicknesses for carbide-tipped tools easily can be read from this nomograph. First, decide on the feed and depth of cut to be used, then lay a straight edge across the chart to connect these values on their proper scales. Chip thickness then is read directly from the angular line, at the point where the straight edge crosses this line





In many cases, the production of a special tool from a shop standard tool is simply a matter of selecting the proper standard tool and then grinding the cutting edges to the shape required. Here, special tools B, C *and* D *have been ground from standard tools shaped like the one shown at* A; *likewise, tools* L, M, *and* N *have been ground from square-point end cutting tools like the one shown at* K. *Time and tool cost are conserved by this practice*

to extremely high hardness and can be sharpened to a keen edge. One such steel has 1.30 percent carbon and 3.5 tungsten; another has 1.25 percent carbon and 5.00 percent tungsten. These tools do not have red-hardness properties, since the tungsten content is too low, and they are quite brittle. They generally can be used to cut hard material at speeds and feeds such as would be used with straight carbon steels. They are water hardening and subject to dimensional instability, warpage and breakage in heat-treatment.

HIGH-SPEED STEELS

In general, high-speed steels have the strength, hardness, toughness, wear resistance and red hardness characteristics required for cutting tools. They can be used at greater speeds and feeds than are possible with carbon tool steels. All are oil hardening and give little difficulty with warpage and breakage in heat-treatment. They can be grouped int two classes—the standard high-speed steels containing tungsten, molybdenum, chromium or vanadium in varying quantities, and the special-purpose high-speed steels which also contain varying proportions of cobalt.

Oldest of the high-speed steels, and the most generally used, is the 18-4-1 type (18 percent tungsten, 4.00 percent chromium, 1.10 percent vanadium, and about 0.70 percent carbon). It combines excellent cutting properties and superior toughness and is well adapted to machining soft and medium hard steels. Alloying elements are kept within close limits, but the carbon content varies between about 0.65 and 0.85 percent to vary the toughness and cutting ability to suit the application.

The 18-4-2 high-speed steel (18.50 percent tungsten, 4.00 percent chromium, 2.10 percent vanadium, 0.75 percent molybdenum, and about 0.70 percent carbon) has superior hardness and resistance to abrasive wear. It is suitable for cutting harder materials or annealed steel at high speeds; gives good results as a finishing tool for heat-treated parts.

The 14-4-2 type (14.00 percent tungsten, 4.00 percent chromium, 2.00 percent vanadium, and about 0.70 percent carbon) is somewhat tougher than the 18-4-1 type because of the lower tungsten content, but has slightly lower cutting efficiency. Its high hardness and resistance to wear make it adaptable to heavy cuts on heat-treated alloy steels.

Recommended for applications for which 18-4-1 steel is suitable, 6-6-2 molybdenum high-speed steel may be used, as it has approximately the same properties. Its composition is as follows: 5.50 percent tungsten, 4.00 percent chromium, 1.50 to 1.65 percent vanadium, 4.50 to 5.00 percent molybdenum, and about 0.80 percent carbon. It is finding use as an all-purpose tool steel and stands up well when used for lathe and planer tools.

Molybdenum - tungsten high - speed steels (1.30 to 2.00 percent tungsten, 3.50 to 4.00 percent chromium, 1.00 to 1.30 percent vanadium, 8.20 to 9.40 percent molybdenum, and 0.75 to 0.84 percent carbon) were the first commercially successful molybdenum high-speed steels. Carbon content is varied to secure the desired toughness or hardness. The low carbon range is used for planer tools and others subject to shock, while the high carbon range is used for lathe tools. Red hardness of these steels is high when heat-treated to give the proper structure.

CAST NON-FERROUS ALLOYS

Stellite is a cobalt-chromium tungsten alloy containing carbon and small amounts of other metals, with iron present only as an impurity. Heavier feeds can be used with Stellite alloys than when turning with carbide-tipped tools, but speeds must be slower. When tool shanks are ¾ in. square or less, solid Stellite tools generally are employed; above that size, Stellite-tipped tools with steel or cast Meehanite shanks can be used to advantage.

Rexalloy is a cast non-ferrous alloy containing approximately 33.00 percent chromium, 44.00 percent cobalt, 17.00 percent tungsten, 2.25 percent carbon and 2.00 percent iron. It ranges in hardness from 60 to 62 Rockwell C. Like other cast non-ferrous alloys, it is best suited for the middle range machining operations, between

CUTTING ANGLES FOR STELLITE 98M2 TURNING TOOLS

Location of Angle	Steel	Cast Steel	Cast Iron	Bronze	Stainless Steel
Side Rake Angle	8-20†	8	4	4	8-20††
Side Cutting Edge Angle	10	10	10	10	10
Side Relief Angle	7	5	5	5	7
Back Rake Angle	8-20†	8	0	4	8-20††
End Cutting Edge Angle	15	10	10	10	15
End Relief Angle	7	5	5	5	7

NOTE: All angles in degrees.

†Angle depends upon grade and type of steel. Generally the harder the steel, the less the rake angle.

†† Angles for stainless steel and Monel metal are dependent on the grade and type being machined.

In general, the same cutting angles are used on boring tools as those recommended for turning tools, with the exception that when small holes are bored, clearance or relief angles must be greater so that the boring tool clears the work.

high-speed steels and cemented carbides. Its high red hardness is indicated by the fact that only one point drop in Rockwell C hardness results from heating to 1900 F. Other properties are toughness and shock resistance and high resistance to abrasion.

Shop use has shown that this material is most efficient when used at cutting speeds ranging from 25 to 80 percent over the maximum for high-speed steel tools. The alloy is recommended for intermittent cuts, for the machining of chilled castings, and for use on semi-rigid machine tools, if there is not too much chatter and looseness. It has been used for machining operations on all types of steel, iron, bronze, copper, brass, aluminum, with the exception of milling operations on steel. Rexalloy tools should be well supported, with overhang held to a minimum.

Tantung, containing tantalum carbide, has a dense structure which makes possible grinding of keen, durable cut-

CUTTING ANGLES FOR CARBIDE-TIPPED TOOLS

Material	Side Rake With Depth of Cut Under ¼-in.	Side Rake With Depth of Cut Over ¼-in.	Back Rake	Side Relief	Front Relief
Steel—Soft (Under 200 Brinell)	8- 8-15	4- 4-12	0- 0-10	6- 7-12	6- 7-12
Steel—Medium Soft (200-275 Brinell)	8- 8-12	4- 4-10	0- 0- 8	6- 7-10	6- 7-10
Steel—Medium (276-350 Brinell)	6- 8-10	4- 4- 8	0- 0- 5	5- 7- 8	5- 7- 8
Steel—Medium Hard (351-425 Brinell)	4- 6- 8	0- 2- 6	0- 0- 3	4- 7- 8	4- 7- 8
Steel—Hard(Over 425 Brinell)	0- 4- 6	0- 0- 4	0- 0- 5#	4- 5- 6	4- 5- 6
Cast Iron	4- 8-10	2- 4- 6	0- 0- 5	4- 5- 6	4- 5- 6
Brass & Bronze	4- 8-10	2- 4- 6	0- 0- 5	4- 7- 8	4- 7- 8
Aluminum	8- 8-15	6- 8-12	0- 0-10	6- 7-10	6- 7-10
Die Castings	8- 8-15	6- 8-12	0- 0-10	6- 7-10	6- 7-10
Hard Rubber	8- 8-20	8- 8-15	5-10-15	6- 7-10	6- 7-10
Soft Rubber	8-15-25	8-12-20	10-15-20	8-10-15	8-10-15
Copper	10-15-20	8-12-15	0- 0-10	6- 7-10	6- 7-10
Fiber	8-10-12	6- 8-10	0- 0-10	6- 7-10	6- 7-10
Plastics	8-10-12	6- 8-10	0- 0-10	6- 7-10	6- 7-10

NOTE: (1) All values shown are in degrees of angle. (2) # Indicates negative rake angle.

The angles shown in this table are intended to apply to jobs where the tool shank is set perpendicular to the work at the point where the nose of the tool contacts the work. A typical example is an ordinary lathe tool set with the cutting edge on the center line of the work. Tools of other types or tools held in other positions with relation to the work should have angles ground to correspond with this standard set-up. In each case, the center value is recommended for average conditions; to meet unusual requirements, the angles can be adjusted within the range indicated by the two outer values.

TROUBLE-SHOOTING RECOMMENDATIONS FOR CARBIDE TOOLS

CHIPPED CUTTING EDGE

When the cutting edge of a carbide-tipped tool chips while under cut, check each of the following:

1. If a heavy cut is being taken, particularly on a rough casting or forging, honing of the cutting edge helps prevent chipping. Scale and heavy chips are apt to flake off a sharp cutting edge. By slightly rounding or chamfering the edge with a silicon carbide or diamond hand hone, you give it sufficient strength to stand up under severe use. Be sure to hone no more than is actually necessary.
2. Check the width of the chip breaker. If the chip is too tight, it may exert excessive pressure on the tool and cause chipping. See recommendations for width of chip breaker.
3. On heavy castings, etc., an increase in feed may break up the scale ahead of the tool—and prevent chipping.
4. On steel-cutting jobs, slow speeds result in the formation of a built-up edge, which causes chipping. Try a higher speed.
5. Alternate heating and quenching of the tip, caused by interruptions in the flow of coolant, will cause chipping. Make sure flow is sufficient, and that it is directed so the chip does not prevent the coolant from reaching the tip at all times.
6. If none of the above suggestions correct the condition, try a different grade of carbide for the tip—a tougher grade may give better results.

CHATTER

The following points should be checked if the tool chatters:

1. Excessive overhang will cause chatter. Make sure tool is well supported.
2. Next, check the work support. If the work vibrates, chatter will result.
3. If the nose radius is too large, the tool is apt to chatter.
4. Check the feed. Too light a feed may result in the tool rubbing instead of cutting. This will cause chatter.
5. Is the chip breaker too narrow? A chip that is too tight will cause chatter.
6. Is the tool sharp? On many materials, dull tools will chatter.
7. Check the end-cutting-edge angle. If this angle is too small, the tool will drag—causing chatter.
8. Vary the side-cutting-edge angle—this changes the direction of the load on the tool and may eliminate the condition.
9. If the cut is spread over a long length of cutting edge, chatter frequently results. This is particularly true with grooving tools. It often is better to use two tools—a narrow tool, followed by a wider one. If the bottom of the groove does not need to be flat, grind the cutting edge to break up the cut.

WORN CUTTING EDGE

When the cutting edge wears rapidly, try the following steps:

1. First, examine the tool with a magnifying glass to make sure the trouble is not minute chipping instead of wear. If chipping is indicated, correct as suggested above.
2. If the tool is actually wearing, check the feed—light feeds tend to wear the cutting edge more rapidly.
3. Excessive speeds cause rapid wear—try a slower speed.
4. Check the tool relief angles—if they are too small, the heel of the tool may be dragging.
5. Check the nose radius—too large a radius accelerates wear. See accompanying recommendations for size of nose radius.
6. If none of the above suggestions help, check the grade of carbide used. Perhaps a harder grade should be employed.

POOR BREAK-UP OF CHIPS

If the chip does not break properly when cutting steel, the trouble probably lies in the chip breaker. Try the following:

1. Widen the chip breaker if the chip is too tight.
2. Narrow the chip breaker, by grinding along the cutting edge. if the chip is too loose.
3. Check the nose radius. Too large a radius distorts the chip and makes it hard to control.
4. Check the coolant supply. A heavy flow of coolant at high velocity makes it easier to break the chip.
5. Check the depth of the chip breaker—a shallow chip breaker results in a loose chip, while a chip breaker that is too deep will curl the chip tightly and may lead to chipped cutting edges or broken tips.

POOR SURFACE FINISH ON WORK

If the finish produced on the work is not satisfactory, check the following:

1. If the finish is rough and torn—increase the cutting speed to minimize or eliminate the built-up edge.
2. If the finish is marred with small flakes of metal—try a smaller nose radius on the tool.

ting edges. It has high transverse rupture strength and is tough and shock resistant. Red hardness is high. Tantalum carbide in the alloy imparts a self-lubricating action. This plus abrasion resistant characteristics tend to minimize cratering from chip wear. Tantung is suitable for both roughing and finishing cuts, and on most materials the finishing cut can be taken at least one speed faster than the roughing cut.

Cemented Carbides are the hardest materials made by man. They consist of crushed and powdered particles of tungsten, tantalum, titanium and other hard carbides, cemented by a matrix of cobalt or other materials by sintering. There are two major types used for tipping single-point tools—the straight tungsten carbides generally used for machining cast iron, aluminum, brass, bronze, copper and other non-ferrous metals, plastics and fiber, and the combined carbides used for machining all types of steels. Combined carbides are basically tungsten carbide with titanium carbide, tantalum carbide, or both, added in small percentages.

Diamond Tools are used where quality of surface finish and dimensional accuracy requirements are high. This is especially true in small bored holes. A diamond tool will hold size and give a better finish than any other tool material available. Because of their hardness, diamond tools do not wear in the accepted sense; they chip through hitting hard spots or because of machine vibration. They can be used for cutting metals, hard rubber, aluminum and plastics.

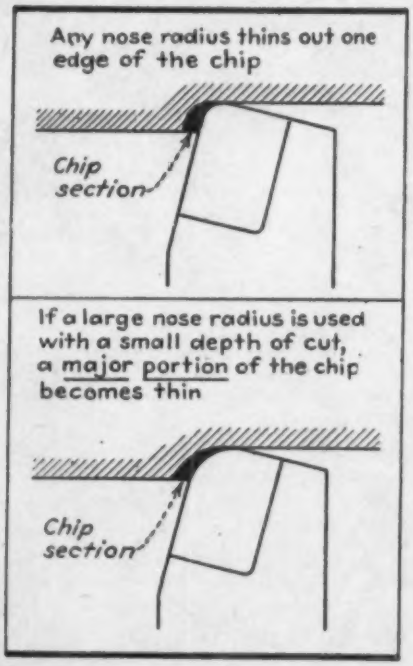
Three types of diamonds are used for making tools: crystallized or *gem* stones; *bortz*, a round or imperfectly crystallized form; and, *carbonados*, or black diamonds, impure aggregates of small diamond crystals. Most shaped diamonds for cutting tools are made from bortz, with stones being required in sizes from 0.15 to 1.25 carats for most tools.

Diamond tools will work satisfactorily at almost any speed, with the general rule being that they should be used at twice the speed used with high-speed steel bits. Fine feeds of about 0.00015 to 0.00035 in. per rev. usually are used with depth of cut ranging from 0.001 to 0.003 in. A soluble oil coolant is recommended for most jobs. Irregular loads on diamond tools may cause chipping of edges.

DESIGN AND APPLICATION RECOMMENDATIONS

To obtain maximum results with greatest economy from cutting tools, supervision of the design, application and sharpening of such tools should be under the control of one man having recognized authority in the shop. In small plants, the cutting tool supervisor will have time for other duties, but in larger plants it will be a full-time job.

It should be the supervisor's duty to coordinate all tool usage, see that proper tools are made for each job, and see that each machining operation is performed with the correct tools. He should direct his activities toward standardization of tools and their uses, in order that unnecessary tools be eliminated.


Any nose radius thins out one edge of the chip
Chip section
If a large nose radius is used with a small depth of cut, a major portion of the chip becomes thin
Chip section

With a large nose radius the chip is thinned out, promoting the formation of a built-up edge on the cutting edge. Chatter often results when the radius is too large

TOOL DESIGN FACTORS

The design of a single-point cutting tool must take into account size, shape and rigidity of the part to be machined, material of which the part is made and its physical condition, the operation and the machine to be used. The tool shape, as defined by the side-cutting-edge angle, ties in directly with the back and side rake angles to determine the ability of a given tool to remove metal efficiently under a given set of operating conditions. Tool shape and rake angles for a given tool differ according to the cutting material of which the tool is made and special requirements of the application.

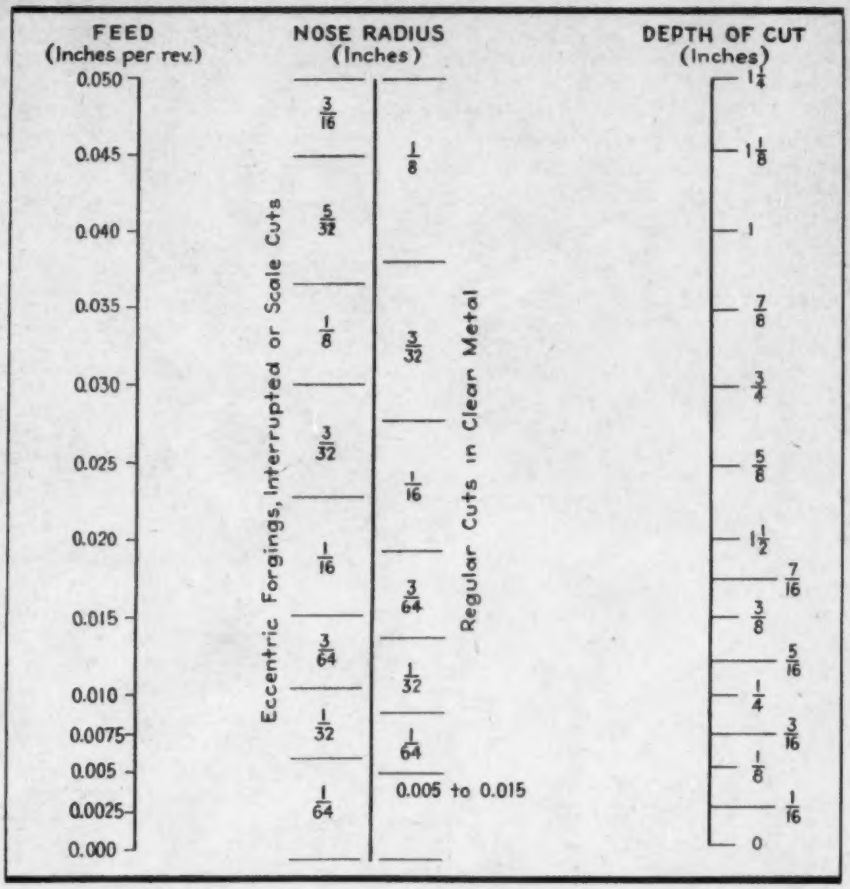
Round-nosed high-speed tools are better for higher speeds than diamond-shaped tools, and it has been proved that coarse feeds and low speeds will remove more metal in a given time than fine feeds and fast speeds. Taylor

"Shear Angle" negative rake carbide-tipped lathe tools give good results on many interrupted cuts. At A *is shown a tool having a negative shear angle of 35 deg. and a positve side rake of 15 deg. set up for turning a large steel shaft having a keyway slot. The sketch at* B *shows how the work first strikes the tool at a place on the cutting edge removed from the point, thus throwing the impact on a stronger section of the cutting edge. The shear action of the chip as the tool cuts the solid portion of the shaft is sketched at* C

CHIP BREAKER DIMENSIONS HIGH-SPEED STEEL TOOLS

Width of Tool	Width of Chip Breaker	Radius at Shoulder
1/4	3/32	1/16
5/16	3/32	1/16
3/8	1/8	1/16
1/2	5/32	3/32
5/8	7/32	1/8
3/4	1/4	1/8
1	1/4	1/8

NOTE: In all cases, angular-type chip breaker grooves are ground at an angle of 8 deg. with the cutting edge, and the width shown is the dimension at the nose end. The chip-breaker ledges are ground with a back rake of 0 deg. and a side rake of 13 deg. The ledge is polished to a finish of 4 to 8 micro-inches and a hand hone is used to remove the feather edge at the cutting edge of the tool. These chip breakers are standard for most steel cutting operations with high-speed steel tools in a large aircraft engine plant. All dimensions are in inches.



To use this nomograph to determine proper nose radius for carbide-tipped tool, join the feed with the depth of cut on their respective scales

WIDTH OF LEDGE-TYPE CHIP BREAKERS FOR CARBIDE-TIPPED TOOLS

Depth of Cut (Inches)	Feed—Inches Per Revolution 0.008 to 0.012	0.013 to 0.017	0.018 to 0.022	0.023 to 0.027	0.028 to 0.032
	Width of Chip Breaker				
1/64 to 3/64	1/16	5/64	3/32	7/64	1/8
1/16 to 1/4	3/32	1/8	5/32	11/64	3/16
1/8 to 1/2	1/8	5/32	3/16	13/64	7/32
3/16 to 3/4	5/32	3/16	7/32	15/64	1/4

NOTE: A chip breaker depth of 0.20 in. is satisfactory for most types of steel. All dimensions are in inches.

also demonstrated the practical applications of broad-nosed tools for roughing cuts at coarse feed and high speed, and their superiority to round-nosed tools operated with coarse feed and slow speed.

For carbide-tipped tools, a suitable side-cutting-edge angle is advantageous because (1) when entering the work, or taking an interrupted cut, the load is taken on the tip at a point back of the nose where the tool is stronger, (2) when leaving the work, there is a gradual reduction of cutting load, and, (3) length of cutting edge in contact with the work is increased and, therefore, pressure per unit of length on the cutting edge is reduced. Except when cutting against a square shoulder, in which case a zero side-cutting-edge angle is necessary, a side-cutting-edge angle of 5 to 20 deg. is recommended for most steel cutting jobs.

To obtain maximum efficiency with carbide-tipped tools, point contact must be held to a minimum. The use of a large nose radius with a small depth of cut results in thinning the major portion of the chip. In cutting steel, the thin chip obtained with a large nose radius leads to the formation of a built-up edge. This leads to abrasion of the end of the tool and shortens its life. Chatter may also develop with a large nose radius.

For average turning and facing jobs with carbide-tipped tools, the end-cutting-edge angle has a practical range of 8 to 15 deg. The angle should never be less than 8 deg., because a small angle increases the tendency to "flat off" the nose of the tool in sharpening, thus increasing the possibility of causing chatter. On jobs where the tool plunges into the work at the start of a cut, the end-cutting-edge angle should be at least 8 deg. greater than the angle at which the tool is fed into the work.

By selecting the proper rake angles it is possible to obtain a tool that cuts freely, thus assuring maximum tool life. On some steel cutting applications, however, it is not practical to use a free-cutting tool because of difficulty in breaking the chip. There can be no hard and fast rules governing the selection of rake angles, no matter what cutting material is used. The rake angles and style and size of chip breaker must be adapted to fit the needs of the individual application.

Relief angles should be sufficient to clear the work and minimize rubbing of the tool on the work. In general, the smaller the relief angles, the stronger the cutting edge. Hence, where cutting pressures are high relief angles of about 7 deg. are satisfactory, but they may range from 5 to 12 deg., depending upon the material being cut.

All of the angles given are for a tool whose shank is perpendicular to the work at the point where the nose of the tool contacts the work. They also

refer to tools set up so point of contact with the work is in line with the work. Hence, the *effective* cutting edge, rake and relief angles are the same as those ground on the tool. Should position of the tool with relation work be changed, effective cutting and relief angles are increased or decreased, depending upon how much the tool is moved, and in what direction. Effective angles are changed by setting the shank at an angle with the work, either horizontally or vertically, that is different from the angle for which the tool was designed. They also are changed by dropping the tool below center, or raising it above center, and by changing direction of feed.

WIDTH OF ANGULAR LEDGE-TYPE CHIP BREAKERS FOR STELLITE 98M2 TOOLS

Depth of Cut (Inches)	Feed—Inches Per Revolution 0.010	0.015	0.020 to 0.025	0.030 to 0.040	0.045 to 0.060	0.065 to 0.080	0.085 to 0.100	0.100 to 0.125
	Width "W" of Chip Breaker							
1/16 to 1/4	3/32	1/8	3/32	1/16	1/4	1/16	3/8	1/2
1/16 to 1/2	1/8	3/32	1/16	1/4	1/16	3/8	7/16	1/2
1/16 to 3/4	3/32	1/16	1/4	1/16	3/8	7/16	1/2	5/8

NOTE: For Stellite 98M2 tools, the angular chip breaker ledges are ground at an angle of 10 deg. with the cutting edge. Depth is 0.010 in. or more, depending on the feed. All dimensions are in inches.

Groove-type chip breakers, when used on Stellite 98M2 tools, have a width equal to 3 or 4 times the feed in inches per revolution. Width of land between the groove and the cutting edge should be 1 to 1½ times the feed in in. per rev., up to a maximum of 0.030 in. Depth of groove should be 0.010 in. or more, depending on the feed.

MEANS OF CHIP CONTROL

Tensile strength of steel leads to production of continuous chips when machining operations are performed with tools of usual shapes. At high cutting speeds, chips are formed so rapidly that, unless controlled, they are dangerous to the tool and the operator. Easy chip disposal requires that the chip be broken into relatively short lengths which easily may be removed from the machine.

The ease with which a chip may be broken depends upon the cross-section area of the chip, nose radius of the cutting tool, and physical characteristics of material being cut. A thin springy chip is hard to break, but can be coiled, whereas a thicker chip having some stiffness can be broken. Breaking characteristics of most steel chips can be improved by rapid cooling with a heavy coolant flow and increasing feed to obtain a chip cross-section which breaks readily.

Successful means of chip control include:

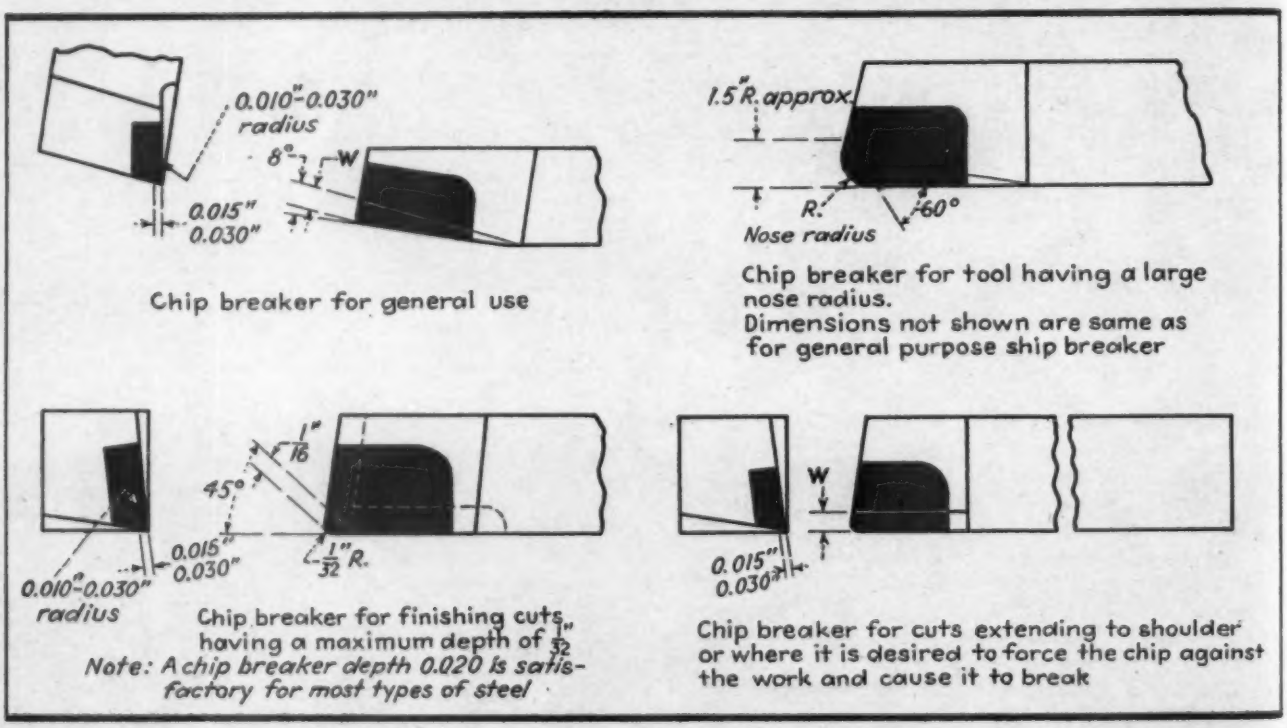
1. The use of a chip breaker ground into the face of the tool to stress chips to the breaking point.

2. The use of a combination of back rake angle, side rake angle, nose radius and side-cutting-edge angle to obtain a coiled chip which can be directed into the work or against some obstacle such as the toolblock which will stress the chip and break it.

3. Using a mechanical chip breaker to stress the chip and cause it to break into short lengths. One design uses a brazed-in carbide tip for cutting and a breaker clamped on top of the tool in such a position that it acts to curl and stress the chip to the breaking point. A number of combination toolholders of similar features have been developed and have been successfully applied.

TOOLHOLDERS

Many styles and sizes of toolholders are available for use on machines ranging in size from small bench lathes to the largest planers and boring mills.


0.010"-0.030" radius
8°
W
0.015" 0.030"
Chip breaker for general use
1.5" R. approx.
R.
60°
Nose radius
Chip breaker for tool having a large nose radius. Dimensions not shown are same as for general purpose ship breaker
1" 16
45°
0.015" 0.030"
1" 32 R.
0.010"-0.030" radius
Chip breaker for finishing cuts having a maximum depth of 1" 32
Note: A chip breaker depth 0.020 is satisfactory for most types of steel
W
0.015" 0.030"
Chip breaker for cuts extending to shoulder or where it is desired to force the chip against the work and cause it to break

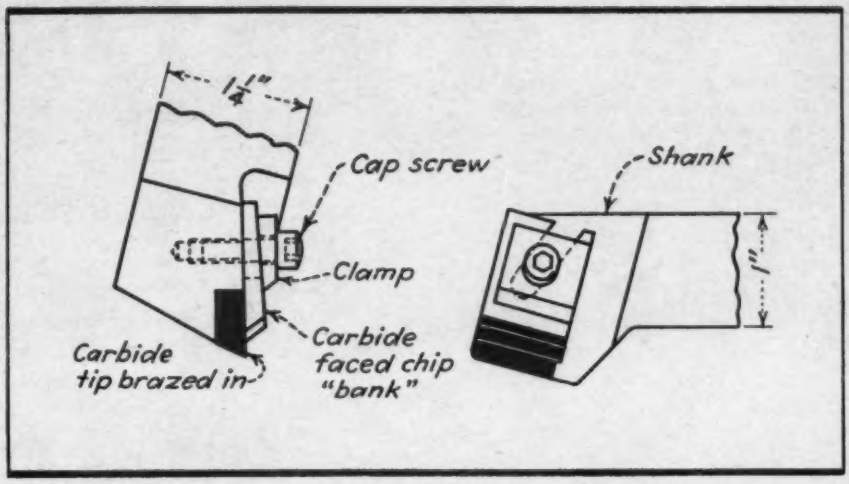
Four types of ground-in chip breakers for carbide-tipped tools are shown in the above sketches. Similar chip breakers work well on tools made of cast non-ferrous alloys

Holders for high-speed steel bits, designed for turning and facing operations, usually position the bit at an angle of 15 deg. with the base of the shank, and this must be taken into consideration when grinding the cutting angles at the end of the bit. Some holders support the toolbit so the bit's cutting point is on the line of deflection and any springing of the tool moves the bit away from the work, not deeper into the cut.

High-speed steel, cast non-ferrous alloy and carbide-tipped bits used in holders of the types described can be ground to the same shapes and angles recommended for solid or tipped tools. In addition to these holders, there are a number of special holders which take special cutters for differing operations. Among these are a threading tool made in the spring type, or in a rigid model, the spring-type cut-off or parting tool, and the adjustable threading tool. An important advantage of all such holders is that with them small toolbits can do the work of solid high-speed steel tools.

For large tools, there are also a wide variety of holders for various classes of work. Among them are single and multiple toolholders for turret lathes and automatic screw machines, and the standard toolposts supplied with lathes of all types. In addition, there are many special toolholders made in metal-working plants to do particular operations or to use less cutting tool materials through the use of small solid toolbits.

Properly designed toolholders and tool setting devices have much to do with eliminating machine down time for changing and adjusting tools. By arranging holders so they can be removed from the machine easily without taking out dull tools, and then replacing it with another holder containing sharp tools, the machine can be kept running a greater portion of the time. This procedure can be followed if holders containing dull tools are sent to the tool grinding room, the tools removed and sharpened to templet and then reset in the holder according to gage. This can be done and tolerances held to plus or minus 0.001 in. at the machine. Toolholders which accomplish the same purpose have interchangeable cartridges into which the tools are mounted before delivery to the machine. Where tool setting gages can be incorporated in the toolholders at the machines, tools may be ground to templets and changes made by the operator at the machine.



This mechanical chip breaker for a carbide-tipped tool has a carbide-faced "bank" clamped on top of the tool face in such a position that it acts to curl and stress the chip to the point of breakage. It can be adjusted to suit various depths of cut and feeds

Position of the cutting edge of the tool relative to the work should be maintained at all times, no matter how often the tool is sharpened. When adjustable wedge-type seats are not provided, shims must be used. The usual method is to use a rocker type of support in the toolpost, and then tilt the tool to bring the cutting edge up to the center line.

This practice changes the effective rake angles and usually eliminates clearance angles, and the tool does not cut efficiently. When shimming the tool up to center, a permanent mark on the toolpost will serve as a convenient guide in determining thickness of shims necessary. Another method is to use a simple templet with which tool position can be checked quickly.

METHODS OF TIPPING TOOLS

High-speed steel tips can be joined to mild steel shanks by several methods, including both low-temperature brazing with silver solder and high-temperature brazing with copper, arc welding with stainless steel electrodes, resistance welding, pressure welding and high-temperature ferro-alloy cementing.

Low-temperature brazing, or silver soldering, is widely used for tipping tools with cast non-ferrous alloys and cemented carbides, as is the ferro-cement method. Some carbide tips are clamped on, with the result that there is less tip breakage, because of the absence of brazing strains. Too, under normal conditions, the tip can be replaced many times during the life of the shank. As the tip becomes smaller in regrinding, it is moved forward and backed by a setscrew. This simplifies grinding, as it is not necessary to grind away the steel shank when sharpening the tool. However, the method does not permit complete use of the tips.

TOOL SHANK MATERIALS

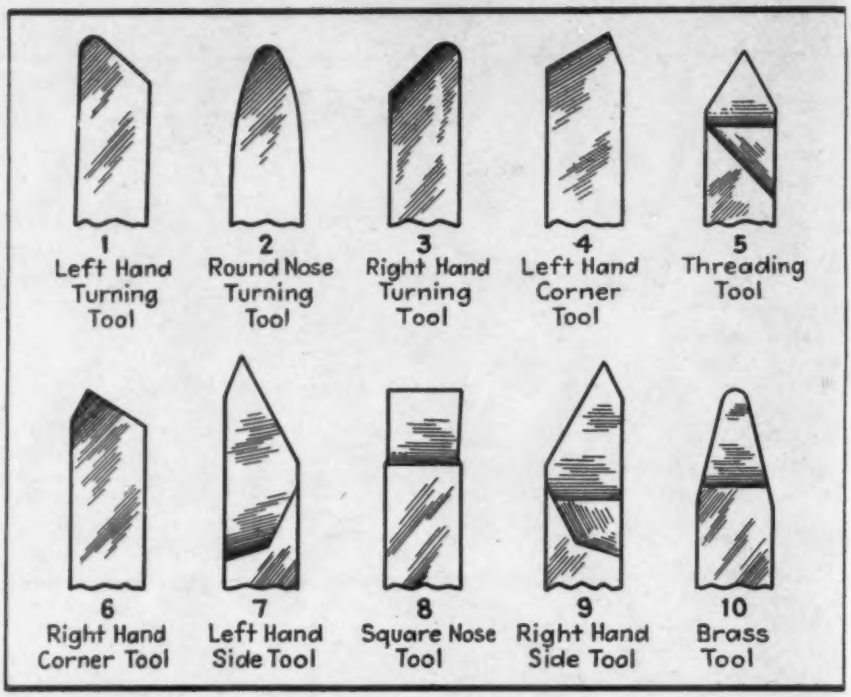
In making tipped tools of any of the cutting materials, shanks can be made of: (1) SAE 9250 (Silman steel), (2) any straight carbon steel with a carbon content of 0.50 to 0.95 percent, (3) SAE 2340, or any low alloy type steel, or, (4) a high tensile strength cast iron, such as Meehanite. Silman steel hardens to about Rockwell 35C after being heated to brazing temperature, so is usually preferred if hard shanks are desired.

An advantage of Meehanite shanks is that they are cast to shape, making it necessary only to surface grind, mill or otherwise shape the bottom of the shank to provide a flat tool seat, mill

for tip insert, braze tip in place and grind. Meehanite is not as strong as steel, thus tool overhang must be kept to a minimum, but the material has twice the damping capacity of steel, reducing chatter and prolonging tool life. Silver solder gives satisfactory joints on these shanks.

PREPARATION OF THE SHANK

Before brazing or cementing tips, shanks must be prepared to receive the tips. This is done by providing a recess in the shank to match the tip. The recess need not match exactly the length of the tip, for if the tip is shorter, the space can be filled with braze metal or left open. Any machining method that provides a flat, but not too smooth, surface for the tip is satisfactory. Some users avoid recessing the shank by brazing the tip to the top of the shank. Where a tip recess is milled in the shank, it is best to mill the shank with the required clearance, rake and cutting edge angles in order to reduce grinding after the tip is in place.



Bits for use in standard toolholders can be ground to the same contours and angles as those recommended for solid and tipped single-point tools

PREPARATION OF THE TIP

A chamfer should be ground on the edge of the tip that fits into corners of the shank recess. Tip radius should be greater than radius in the recess. It is not necessary to grind carbide tip surfaces before brazing, in fact certain grades are nickel-plated to improve brazing characteristics and this plating should not be ground off. Mechanical cleaning is recommended for surfaces of cast non-ferrous alloy tips before brazing. This can be done by touching the joint surfaces of the tips lightly against the flat side of a silicon carbide wheel, then cleaning with carbon tetrachloride.

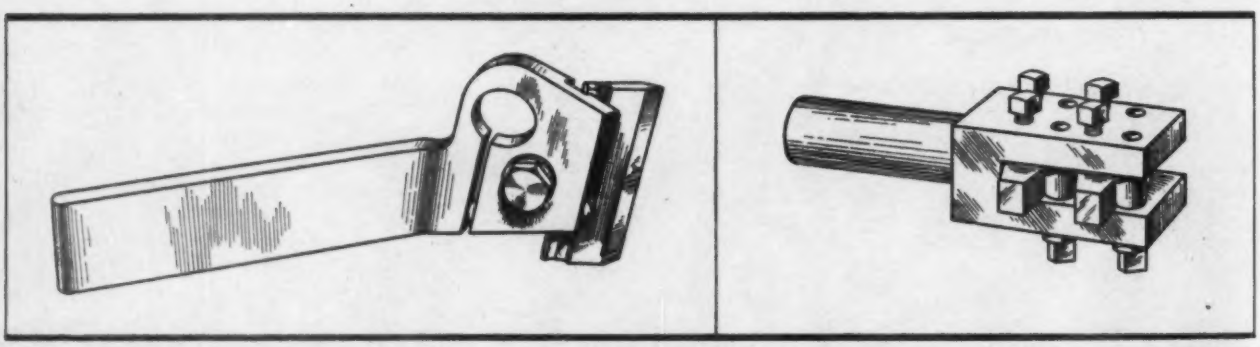
BUILT-UP TOOLS

Another method of tipping mild steel shanks to make single-point tools consists of milling or grinding a recess in the end of the steel shank, and then building up, with successive layers of weld metal, a cutting surface of the proper size and shape. The tool is ground to size after welding has been completed. One rod suitable for this purpose is a cast ferrous alloy containing molybdenum, cobalt, chromium, vanadium and boron. It has the toughness of high-speed steel and wear resistance comparable to some cemented carbides. It can be welded to all types of high-speed, alloy, and carbon steels by the oxyacetylene process without the use of flux. The welded tool can be annealed so as to be readily machined and subsequently heat-treated and drawn. Thus a tool can be produced having a surface hardness of 60 to 70 Rockwell C, which also has high red hardness and resistance to abrasion.

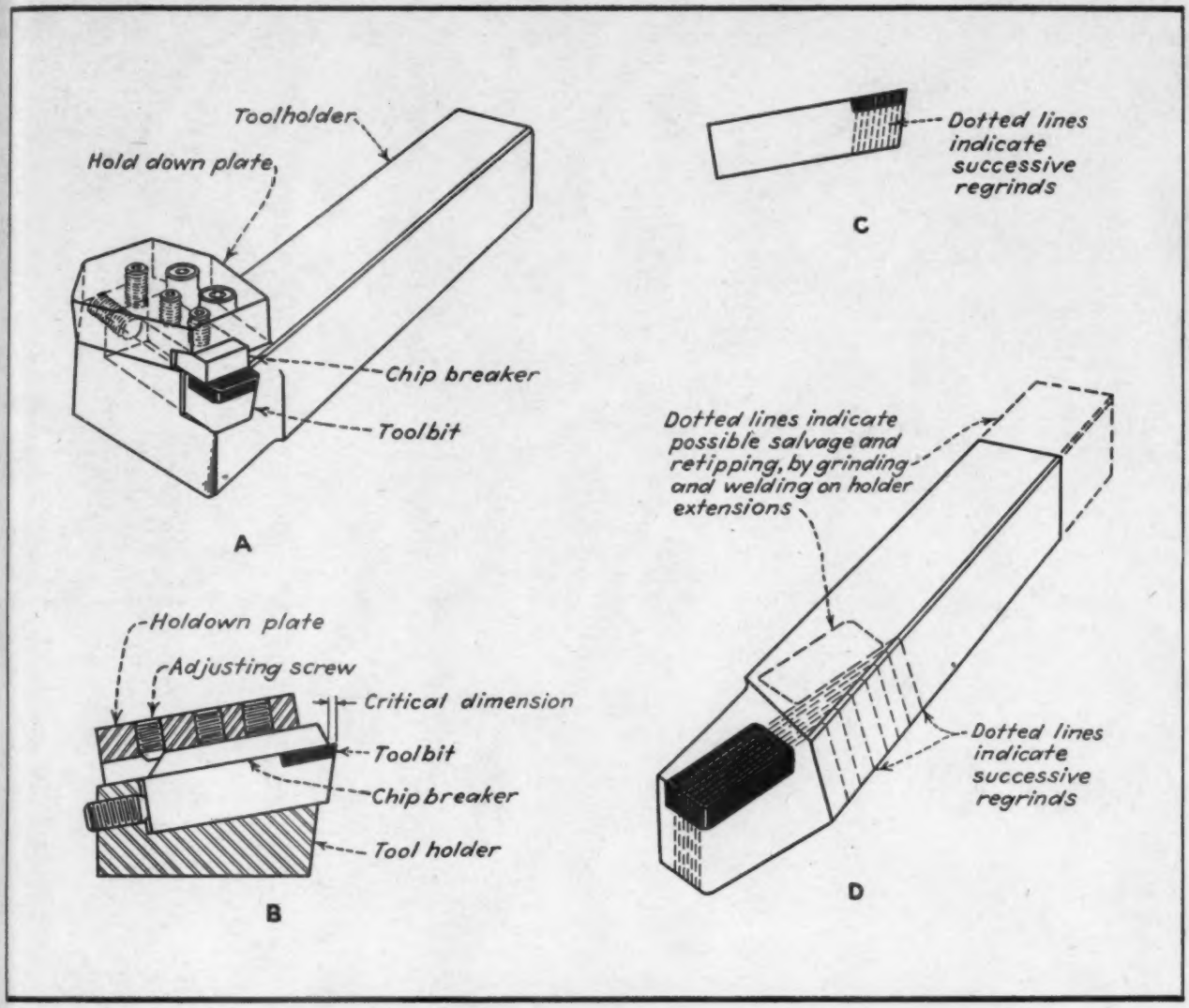
JOINING METHODS

High-temperature copper brazing can be employed for tipping annealed high-speed steel tips on mild steel shanks. This operation requires a high heat furnace of the type used for hardening solid high-speed steel tools. A preheating furnace is useful, but if one is not available, the required preheat may be applied in the cooler portions of the high-heat furnace. Copper shims 0.003 to 0.005 in. thick are cut to fit the bottom of the groove.

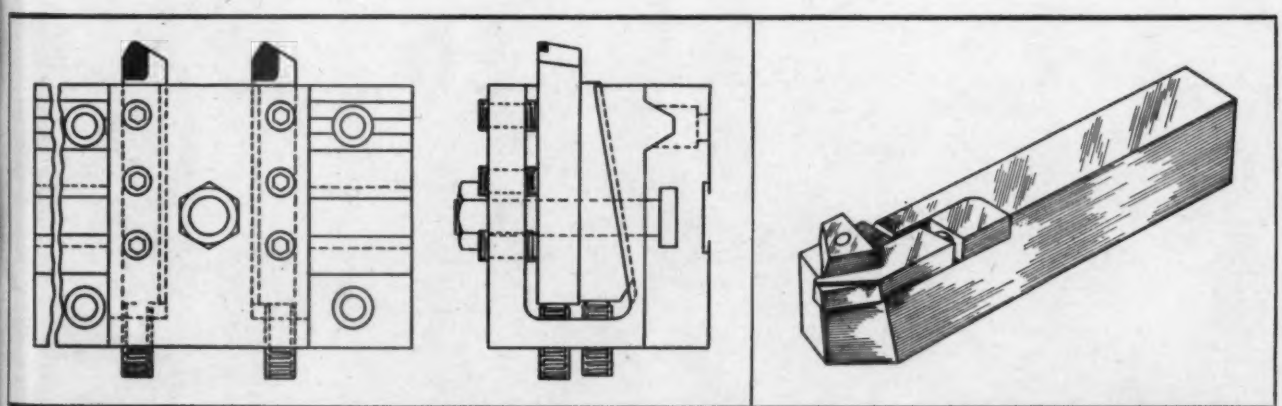
Low-temperature brazing with an oxyacetylene hand torch is the most common method for tipping single point tools. Heat for low-tempera-



(Left) A number of spring-type tools, of which this threading tool is an example, are available for lathe operations. The resilient support provided by spring-type holders permits smooth cuts when machining hard materials. (Right) Multiple cutter holders for turret lathes and screw machines make it possible to combine two or more cuts in one operation. Solid or tipped single-point tools can be used



The toolholder shown at A *and* B *makes it possible to use the small standard square-nose tipped tool* C *in place of the large tipped tool shown at* D. *Dotted lines on sketches* C *and* D *indicate the difference in the amount of metal removed when regrinding each tool*



(Left) Interchangeable toolholders make it possible for tools to be set in the grinding room, and then reset on the machine to within plus or minus 0.001 in. tolerance on the work. (Right) The carbide-tipped bit in this holder is moved forward to make up for material ground away when the tool is sharpened. The clamp is not used to break the chip—a chip breaker is ground into the tip itself

ture (silver solder) brazing also can be applied by furnace, by induction heating or by using compacted burners with city gas.

Where carbide tips are ¾ in. or more long, or are made from one of the steel-cutting grades, a "sandwich braze" often is used. This follows the usual brazing procedure, with the exception that the single sheet of solder foil is replaced with a sandwich made of a sheet of brazing alloy on each side of a sheet of constantan. The constantan does not melt at brazing temperatures, is ductile, and absorbs brazing strains set up by expansion and contraction of tip and shank.

Some manufacturers recommend annealing tools with carbide tips and steel shanks after brazing has been completed, especially in the case of large tools tipped with a steel-cutting grade carbide containing titanium carbide.

SUGGESTED GRINDING PRACTICES

Correct tool angles or contours seldom are attained on cutting tools when they are sharpened on floor or bench stands, and off-hand grinding of tools by the individual machinist cannot be recommended except for circumstances where it is not possible to equip a centralized tool grinding room. If tools are to be sharpened to the correct cutting angles, it is important that such work be entrusted to trained operators who are provided with the necessary grinding and honing equipment, and with gages and templets for checking their work.

When selecting grinding wheels and setting a grinding procedure for cutting tools, recommendations of grinding wheel and cutting tool material manufacturers should be followed if the best results are to be obtained at the least cost.

SHARPENING HIGH-SPEED STEEL TOOLS

In grinding any of the high-speed steels, wet grinding is preferred, provided the supply of water is sufficient to flood the work. Softer wheels should be used for dry grinding than when grinding wet. The grinding wheel should run toward the cutting edge whenever possible, to prevent burning the edge. For the same reason, the tool must be kept constantly in motion when grinding a high-speed steel tool off-hand. Aluminum oxide wheels with vitrified bond generally are recommended, both for off-hand and machine grinding.

The ground finish on cutting surfaces of a single-point tool cannot be too good. One large user of high-speed steel tools has found that tool life can be increased between grinds in most cases by finishing the cutting surfaces to a 4 to 8 micro-inch finish with a 320-grit wheel after grinding tools in the normal way. Machine grinding is necessary to get these results.

SHARPENING CAST ALLOY TOOLS

Procedures similar to those used for high-speed steel tools are recommended when sharpening tools made of cast non-ferrous alloys. Wheels should be one to two grades softer to avoid checking. When grinding off-hand, the tool should be supported on an adjustable rest in order to maintain correct angles and to produce a smooth edge. When possible, it is advisable to finish with a very fine grain aluminum oxide wheel or a diamond wheel in order to get a perfectly finished tool. These tools can be ground wet or dry, but if ground wet there should be an adequate supply of coolant. Light cuts should be taken when machine grinding, and the wheel should be kept in a free-cutting condition by frequent dressing, to avoid checking the work.

SHARPENING CEMENTED CARBIDE TOOLS

Because of their extreme hardness, cemented carbide tools cannot be ground with wheels suitable for high-speed steel tools. Either silicon carbide or diamond wheels are necessary. Silicon carbide wheels must have a soft bond so they will break down readily to expose new, sharp grains. With the correct wheel and the proper grinding procedure, carbide tools can be ground as easily and as quickly as other tools — but certain precautions must be observed to prevent damage to the tip from excessive heat. Freehand grinding generally is recommended, since it is faster, more economical and safer than machine grinding—fewer chips are cracked. Wet grinding is satisfactory, if the tool and wheel are really flooded. Since it is hard to insure that adequate coolant is used, dry grinding generally is recommended. When diamond wheels are used, however, a solution made of soluble oil and water (or kerosene) fed onto the wheel in a steady flow gives good results. In either case, cup wheels are preferred. It is important to keep the tool in motion constantly while grinding to avoid excessive heating and possible cracking.

Grinding of chip breakers in steel-cutting tools is best done on a tool and cutter grinder, with a straight resinoid bond diamond wheel of 100 grit. The tool is held in a universal vise for this operation. Infeed should be not more than 0.0005 in. per pass and the wheel should be set so as to cover the full width of the chip breaker.

TYPICAL GRINDING PROCEDURE FOR HIGH-SPEED STEEL TOOLS

1. Rough grind side and end faces on Sellers Tub grinder. Use soft coarse-grained aluminum oxide wheel of the vitrified bond type.
2. Semi-finish grind nose radius, side and end faces on Oliver tool grinder. Use a soft, fine-grained aluminum oxide wheel of the vitrified bond type.
3. Grind chip breaker on surface grinder. Use soft, medium-grained aluminum oxide wheel of the vitrified bond type.
4. Super-finish chip breaker on surface grinder. Use a medium hard, very fine aluminous oxide-grained wheel of the vitrified bond type.
5. Super-finish nose radius side and end faces on Ex-Cell-O grinder. Use a medium hard, very fine aluminous oxide-grained vitrified wheel.

Process Control for Spotwelding Aluminum—I

AIRCRAFT MANUFACTURERS have found it desirable to develop process and inspection specifications for spotwelding aluminum alloys to supplement the "Tentative Standards and Recommended Practices and Procedures for Spot Welding Aluminum Alloys," issued in 1942 by the American Welding Society. Therefore, through the courtesy of Fleetwings Division, Kaiser Cargo, Inc., recently developed process manuals have been abstracted in respect to the following topics: (1) causes of trouble in spotwelding, (2) cleaning methods, (3) process control and inspection, and (4) preventive maintenance of equipment.

The manuals were developed by Fleetwings to control quality by what may be termed the "manual" method: that is, instead of depending upon routine manufacturing methods, every step—design, tooling, manufacture and inspection of spotwelded assemblies—is watched by a group in the engineering department. The manuals were developed by the group to serve as specifications for control over the various fabricating operations involved.

It is possible to produce resistance welds having shear strength in excess of an equivalent rivet. However, in such welds there is a tendency for cracks to form, which in some cases are visible to the eye. Cracks offer a starting point for corrosion due to the collection of moisture and dirt. It is possible to make good welds of high shear strength without cracks, if care is exercised in the cleaning and fitting of parts. Process control standards are therefore important to quality.

Maintenance of Equipment

A. General Instructions:

1. After any major repair, adjustment, or routine maintenance the machine shall be checked for consistent and sound spotwelding as specified below:

Machines shall then be checked for consistent and sound spotwelding by shear and quick section tests before use in production welding. A variation of ± 10 percent of the average shear strength for 84 percent of the specimens is permitted and ± 20 percent variation is permitted on the remaining 16 percent of the specimens. The consistency test shall be made on 0.020 to 0.020, 0.040 to 0.040, and 0.064 to 0.064 in. material for the particular alloys; and shall consist of 25 specimens for each thickness combination unless otherwise specified by the process or welding engineer.

2. Every effort shall be made to prevent altering the machine calibration by changes or adjustments. In the event that such changes are unavoidable the machine shall be re-calibrated.

3. The plant engineering department shall keep a log book for each aluminum spotwelding machine. This log shall include the date and extent of all routine and breakdown maintenance on the equipment, and shall form a basis for determining which equipment is in need of routine maintenance plus furnishing information for the possible modification of the routine maintenance program. Copies of the log book data shall be transmitted to the process engineering department on the first of each month.

4. It shall be the responsibility of the spotwelding supervisor to check all connections necessary for each production set-up to see that the secondary electrical connections (lower arm plate, electrodes, electrode arms, fastening nuts) are bright and clean and a good water flow through the electrodes and transformer is obtained. The operator or supervisor shall check tip force consistency on repeat operation with a tip pressure gage for each production set-up. The operator shall also report any indication of faulty equipment to the welding foreman.

5. With the exception of the items referred to in paragraph (4), the plant engineering department will be responsible for all maintenance of the aluminum spotwelding equipment.

6. Any proposed change in machine wiring or structure shall be reported in writing to the welding engineer and approval shall be obtained before proceeding.

B. Routine Inspection and Maintenance

1. Daily Maintenance (every 24 hours).

(a) Check the oil well which lubricates the air pressure system, refilling when necessary.

(b) Make visual check of operation and firing of all tubes without shutting down the equipment.

2. Weekly Maintenance (in addition to the above).

(a) Remove dust from all parts of the control panel with vacuum cleaner and compressed air.

(b) Clean dust filters on control panel with vacuum cleaner and compressed air.

(c) Remove dirt and moisture from pneumatic circuit.

(d) Check all lubrication, making additions where necessary.

(e) Check relays in the control panel, paying particular attention to cleaning of contacts and moving parts to insure proper operation.

(f) Thoroughly check the operation of all tubes and replace any faulty tubes.

(g) Clean mechanical equipment.

3. Monthly Maintenance (in addition to the above).

(a) Completely inspect and check operation of the air regulators, lift mechanism and motor brake.

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Process Control for Spotwelding Aluminum—II

(b) Check condition of armored cable from machine to pedal, paying particular attention to connections to pedal and machine.

(c) Check air-gage calibration.

(d) Check operation and calibration of sequence-panel timers, replacing defective units from stock units that have been repaired and adjusted.

(e) Check all gears.

(f) Tighten and align rocker-arms.

(g) Lubricate center attachment nut and tighten if necessary.

(h) Replace burned-out pilot lights.

(i) Clean and tighten welding transformer tap-changing connections.

4. Quarterly Maintenance (in addition to the above).

(a) Replace air filters.

(b) Remove pressure gages and replace with tested gages from stock. Gages removed shall be tested, calibrated, sealed and placed in stock for installation on the next machine to be serviced.

(c) Clean water lines on transformers and electrodes and check flow. A minimum of 2 gal. per min. for electrode cooling is required with a standard set-up. Replace hose if necessary.

(d) Check all relays for mechanical operation, repairing worn bearings and defective coils.

(e) Clean and wipe high-voltage insulation.

(f) Check condition of piston leather and packing by visual inspection.

(g) Overhaul foot switches, clean contacts and replace springs.

5. Semi-Annual Maintenance (in addition to the above).

(a) Change all relay contacts subject to continuous operation.

(b) Replace diaphragm in pressure regulator.

(c) Check all bushings on mechanical system and eliminate excessive play.

(d) Remove air valves and actuating solenoid and replace with tested units from stock. Units removed shall be overhauled, tested and placed in stock for installation on the next machine to be serviced.

(e) Tighten all welding transformer connections.

(f) Repair defective water valves.

6. Yearly Maintenance (in addition to the above).

(a) Make a complete overhaul of each machine, including the following:

(b) Replace all leathers and packings, including piston leathers and cylinder glands.

(c) Completely overhaul relays, contactors and timers, replacing worn and defective parts.

(d) Check all electrical connections, terminals and soldered joints.

(e) Remove pressure regulators and replace with tested units from stock. Regulators removed shall be overhauled, tested and placed in stock for installation on the next machine to be serviced.

(f) Remove air lubricators and replace with tested units from stock. Lubricators removed shall be overhauled, tested and placed in stock for installation on the next machine to be serviced.

Causes of Poor Welds

A. Weak spots are caused by:

1. Too low a current.
2. Too short a time of current flow.
3. Improper cleaning of surfaces.
4. Excessive pressure.
5. Improper maintenance of electrode contour during welding operation.

B. Blown spots (hole through material) are caused by:

1. Failure of electronic tubes and circuits, resulting in excessive current flow or failure to cut off after the proper interval.
2. Mechanical defects resulting in loss of pressure during the weld.
3. Dirt or adhesive tape between the surfaces.

C. Cracked, burned or pitted spots are caused by:

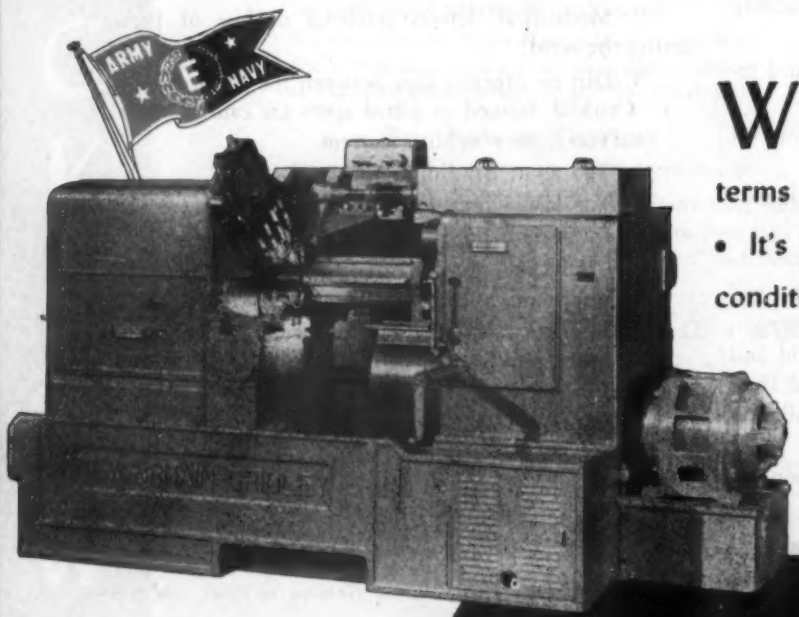
1. Too high a welding current.
2. Too short a welding time.
3. Too low a pressure on welding tips.
4. Insufficient pressure dwell time after weld.
5. Insufficient squeeze time before the weld.
6. Improper cleaning of welding electrodes.
7. Improper shaping of welding electrodes.
8. Improper cleaning of material being welded.

D. Excessive distortion is caused by:

1. Improper fit and assembly of parts.
2. Improper machine set-up.
3. Too little edge distance.
4. Spacing spots too close.
5. Too much or too little pressure on electrodes.

Future installments will discuss cleaning methods, and process control and inspection.

What's Your Shop's COMPETITION RATING?



WILL over-age and out-moded machines make it difficult or impossible to keep pace, in terms of fast schedules and low cost production? • It's time to survey your shop to see how such conditions could be corrected. Why not invite your New Britain representative to assist you? His practiced eye and engineering experience may well prove invaluable in such a study.

NEW BRITAIN-GRIDLEY
MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN CONNECTICUT

Gaging Business

$65 Billion Backlog

At the end of September, 1944, the war order backlog for American industry approximated $65,000,000,000, or about one year's output at the September rate of munition production totaling $5,300,000,000. Barring unforeseen military reversals, new cuts in war programs are likely to offset new contracts over coming months. However, specific slashes in war production set for VE-Day (Victory-in-Europe) fall between $20,000,000,000 and $25,000,000,000. If the European War lasts until next March, monthly munition output in the first quarter would cut the overall backlog to about $49,000,000,000, even allowing for some possible increases in the B-29 and rocket programs. Accordingly, a $20,000,000,000 cut in war output on VE-Day would enable industry to go at reconversion in a big way at that time.

However, it is likely that the size of the reduction in the munition program will change as time goes by and various contracts run out. In any event, volume output of many civilian durable goods is unlikely until late 1945 because of the probable difficulty that industry will experience after VE-Day in the way of plant rearrangement, securing the necessary tools, raw materials and components, and so on. Because of this, industry is likely to accept government rationing of the first refrigerators, autos, and other items that are produced until volume output is achieved for an extended period.

Meanwhile the nation's employment force will continue to decline in coming months, and unemployment will steadily increase, as WPB slowly ekes out its "spot authorizations."

War Items Still Short

Government officials are stilll bemoaning the fact that output of various items is still behind schedule and are making study after study of the reasons for it in the vague hope that some new solution to this old problem will present itself. Guns and fire control production in September was 11 percent below schedule, while combat and motor vehicles were 9 percent below schedule. Observers believe that these lags will continue until some realistic action on labor productivity is taken. For many months, the War Manpower Commission has attempted to divert needed manpower to the industries with lagging munitions output, but there has not been available enough labor with the right experience in the right area at the right time.

Labor incentives have been discussed, but usually avoided. In the tire-building industry, a government inquiry disclosed months ago that labor could turn out more tires despite the present existence of an ineffective incentive system. By common agreement, union members have consistently restricted production to the extent that all workers in particular tire plants receive exactly the same wage week after week. Months ago, it was suggested that the government meet with union leaders to discuss a real incentive system to boost tire output. Since nothing has been done on this, tire output continues to lag behind schedules and hold back the heavy truck program.

Tool Output Limited

It is now revealed that the current reduced level of tool shipments is not only the result of manpower shortages, but also due to component bottlenecks. For example, lack of motors and pumps is reportedly holding up the production of shell-loading equipment. Thus, even if the industry's labor force were increased above current levels of around 54,000,000 workers, it is doubtful that monthly shipments could be increased much over the September level of $35,876,000. However, tool builders expect some relief in manpower by shifting labor from other work as war sub-contracts are cancelled or reduced.

This dashes whatever hopes the auto industry may have had that early deliveries to it of required tools might be possible if tool makers secured more manpower to increase shipments. At the end of September, 1944, only $9,298,000 of the toolmakers' backlog of $198,682,000 consisted of unrated orders, and of this about $8,000,000 in non-rated business had been placed in September.

Unrated Order Prospects

On the face of it, the current backlog would be exhausted by February, 1945, which would indicate some possible deliveries of auto tool orders by March, 1945. However, it is a fact that Russian tool orders have strong official sponsorship and take up a good portion of the industry's present capacity for unrated orders. Although the E-1-b Order tentatively set aside 75 percent of the industry's capacity for military business and the remaining 25 percent for non-war orders, it is reported that declining military orders is freeing some of the military capacity for unrated orders. Some companies are said to be able to assign as much as 80 percent of their current capacity to non-military business due to the lack of war orders.

8-Month Wait for Presses

However, the industry faces an eight-month wait for presses. The backlog of metal-forming and shaping equipment manufacturers at the end of September amounted to $70,870,000, as against that month's shipments of $8,232,000. Unrated orders amounted to $3,333,000, most of which were for the automotive industry.

The latest official estimate of auto industry requirements is placed at 4,600 tools expected to be secured from government-owned surpluses, and 4,800 new tools, with a combined value of $50,0000,000. A government estimate of the industry's needs of tools and other equipment puts the total at $240,000,000, including such items as presses and other heavy equipment which are not included in regular tool statistics.

Truck Bottleneck — These four tiny malleable castings, displayed by Colonel E. L. Cummings, Chief Engineer, Detroit Ordnance Office, are bottlenecking truck production

Steel and Auto Industries Study 1945 Sheet Steel Supply

Durable consumer goods industries may tax available capacity. Foreign demands for sheet and strip loom heavy. Cold-rolled steel a particular problem

WASHINGTON—Both the steel industry and automobile producers are studying prospective requirements for sheet and strip steel after the end of the German War to determine whether this may bottleneck the reconversion, and if so for how long. Auto makers are particularly concerned over cold-rolled steel, since requirements for trim and finish of all types of consumer durable goods may be tremendous. What may make this situation worse is that there will be little suitable steel of this type available in surplus inventories of war contractors.

Steel experts expect that the nation's plate requirements after VE-Day can be easily handled by the universal plate mills and the sheared plate mills, thus freeing the 22 continuous rolling mills to cope with reconversion sheet and strip steel requirements. At capacity, these mills could produce more strip and sheet than have ever been consumed in any single year.

The nation's sheet and strip capacity is set at about 15,000,000 net tons, with the specific tonnage actually available from our 25 continuous mills depending upon the width and gauge of the required tonnage. Maximum amount of hot-rolled sheet was the 13,602,685 tons turned out in 1941, when 2,335,500 tons of strip were also produced.

Foreign Demand Also Huge

However, the record demand for sheet and strip after VE-Day will stem not only from somewhat reduced military needs and heavy requirements from the auto, refrigerator, washing machine and vacuum cleaner manufacturers, but also from large domestic and foreign requirements for prefabricated housing. Since prefabricated housing may represent a large portion of the home construction planned in this country, it will place increased pressure upon the flat-rolled steel situation.

The cheaper Quonsett huts of curved corrugated steel thrown up in this country and abroad to house military personnel may be in heavy demand to shelter the homeless in bombed-out European nations. This will be an urgent need until more permanent housing can be erected for them, and it is likely that such steel orders would hold high priority with government sponsorship.

Delivery Lag May Help

The steel industry is pinning some of its hopes during reconversion on the expectation that the time lag for required deliveries to various manufacturers after VE-Day will tend to level off the pressure on available capacity. Some further relief is expected from surplus steel inventories arising from cancelled contracts. But it would be both difficult and time-consuming to enlarge the industry's steel and strip capacity by trying to convert plate mills to rolling lighter gauges of steel. Such conversion would require setting up additional rolls, cooling beds, and flying shears, and many existing plate facilities could not be physically converted along such lines.

Converting the Geneva Mill

One plate mill conversion possibility is the Geneva mill in Utah, owned by the government. This mill was originally constructed with provision being made for possible conversion to a sheet mill. But its practical handicap is the freight differential that would have to be paid by consumers purchasing from this mill. It is likely that many industries would be prepared to pay the freight extra to get flat-rolled steel for a period of time after VE-Day, but as demand would level off later on, the Geneva mill would be forced into idleness.

The fact that capacity demand for flat-rolled steel might only last one or two years does not invite the steel industry to enter into facilities expansion programs at this time.

One possibility that is being discussed by steel experts is that consumers may be willing to take slightly heavier flat-rolled steel, which might fall into the plate category, due to the unavailability of enough lighter gauge steel. Such emergency arrangements could carry American industry through the peak reconversion demand period.

BRITISH EXPECT POSTWAR SHEET STEEL SHORTAGE

LONDON—British steel officials believe there will not be enough sheet steel produced in this country after the war to meet requirements. In 1939, British sheet steel output was about 1,500,000 long tons, approximating the average for pre-war years. Although current output is secret, it is believed not to be much greater than this average. Yet, potential postwar demands include 500,000 tons a year for steel houses, 600,000 tons for the motor car industry, and 400,000 tons for other needs. However, pre-war British exports amounted to 300,000 tons of sheets a year, and indications are that the British do not intend to lose this trade.

From these figures, it is obvious that there will be immediate postwar demands for increasing the steel producing capacity, although its financing will be a problem. But since there is no possibility of an early increase in capacity, steel producers believe that the government will have to set up priorities for sheet steel to prevent a scramble for the product right after the war. This has been proposed to the government, but no definite decision on this matter has yet been made.

SWPA ANNOUNCES DISPOSAL PLAN FOR CUTTING TOOLS

WASHINGTON—A plan for disposing of cutting tools by making the particular manufacturers of such surplus items agents of Defense Plant Corporation, was revealed in the report by the Surplus War Property Administration to the Director of War Mobilization. The makers would have their brand tools returned to them, would inspect, repair and store them, and then proceed to sell them on a percentage relationship with new cutting tool sales. Sales commissions would be paid to the manufacturers. Although the plan has already been approved by SWPA and OCS, it must receive the approval of the Attorney General. If okayed, it may be extended to other products, such as bearings.

The SWPA reported that $465,207,000 in declared surpluses was on hand on September 30, 1944, up to which date $85,007,000 of other surplus had been disposed of. In addition, $700,751,000 worth of excess property was in process of screening by the owning agencies to determine whether or not it should be declared surplus. The bulk of this property consisted of capital goods, the disposal of which is now assigned to RFC.

$21,000,000,000 in Terminations

WASHINGTON—Total cancellations by the Army, Navy, and Maritime Commission since July, 1940, topped $21,000,000,000, involving 37,000 contracts, according to the report of the Office of Contract Settlement to Congress. Up to September, 1944, 28,000 of these terminations had been settled by payments of $340,000,000 against claims presented for $9,000,000,000 in cancellations, averaging less than four percent of contract face value. Of all prime contracts settled, 48 percent took over six months time. Still unsettled are 9,000 contracts.

Wartime Washington

Reconversion Soft-pedaled

Every statement now being made by Washington about reconversion is prefaced by emphasis on the continuing urgency for various war items. Government officials believe war output is lagging partly due to the great to-do that has been made over reconversion planning. Thus, planning will take a quieter tack from now on.

Observers once wondering whether group reconversion programming would win over plans for a first-come-first-served procedure seem to have overlooked the fact that sponsors of the latter plan have won out in WPB. At present, all group programs for various civilian products have been shelved and the only programming being carried on is for spot urgencies of non-military items by the military. For example, Army needs for pressure cookers would warrant such a plan.

Spot Process May Change

Rumors of changes in "spot" procedure continue, and hopes remain high that the War Manpower Commission may take a more favorable attitude toward the program. Attempts are also being made to speed up the paper work, although processing of applications continues to lag by several thousands. Up through the end of October, only 1,983 applications had been acted upon, and 389 of these had been denied. Approvals authorized the production of $92,671,000 worth of civilian goods during the fourth quarter of 1944, $97,300,000 during the first quarter of 1945, and $90,734,000 in the second.

Also disturbing is the fact that thus far spots only call for 22,876 tons of carbon steel and 9,797,000 pounds of aluminum. It is pointed out that 200,000 tons of steel have been set aside for this purpose, and aluminum surpluses are still too high. WPB officials insist that the speeding up of authorizations will see all of the available steel used up.

Foreign Trade Worries

Both FEA and the State Department are worried over the fact that many contracts to buy minerals from various Latin-American nations will be allowed to run out early in 1945 without renewal. Many of these nations, such as Chile and Mexico, are heavily dependent upon U.S. purchases, and will be unable to find substitute outlets for their production. As a result, widespread unemployment may occur in various Latin-American mining areas, and embassies in Washington have already called this danger to the attention of federal authorities. However, officials hesitate to continue buying unneeded minerals in Latin-America when we may soon find it difficult to support our own mines, and when we already have built up excessive surpluses of these minerals.

The British may keep some $110,000,000 in lend-lease tools provided that they can purchase them at prices closer to the lower levels for British machine tools. American officials seek assurances that these tools would not be later sold in the world market, and would like to have the British take all of them, rather than select the best of them.

The Department of Commerce plans to undertake a program of finding American purchasers for various items that foreign nations are offering for sale to us. The theory is that by stimulating our purchases abroad, we can balance out our international trade and support a higher level of exports.

New Appointments Pending

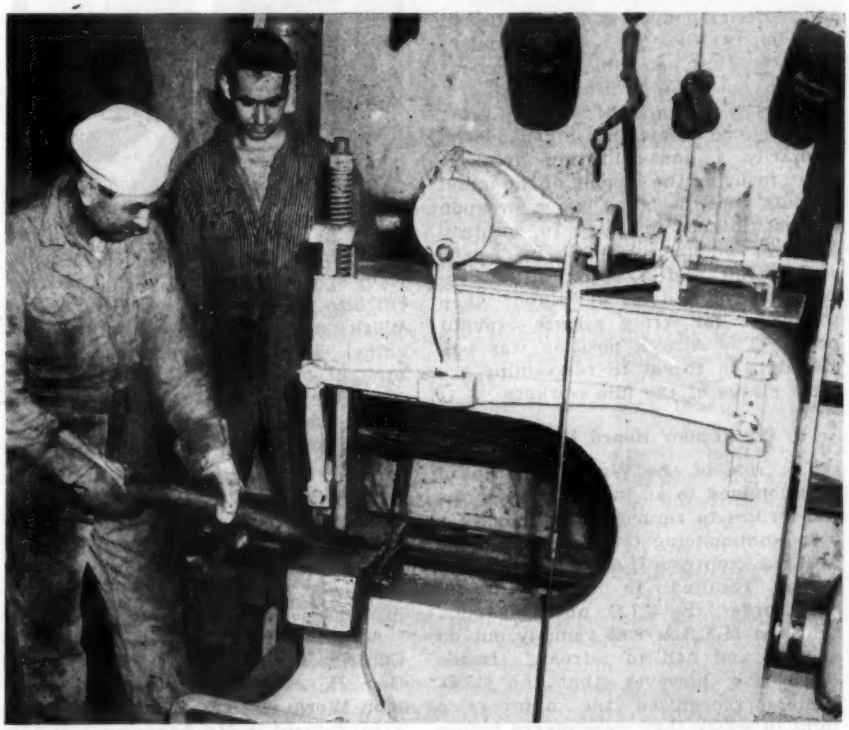
Prior to the election, many government bureaus and agencies issued summary reports of their accomplishments. It is not quite clear whether this was done to bolster the present administration's case, or to make a case for the particular agency in case of a change in administration. But the report to Congress of the Office of Contract Settlement, and the report of the Surplus War Property Administration to the Director of War Mobilization were held back until after the election.

The report of SWPA was literally the swan song of that agency, since its head, Will Clayton, will soon be replaced by a three-man Surplus Property Board. There are many rumors concerning the probable appointees of the President to this board, but reliable information on this is scarce. There are rumors, too, that Fred M. Vinson will replace James F. Byrnes as director of the Office of War Mobilization and Reconversion; that Mr. Stettinius may replace the ageing Hull as Secretary of State; and that Sidney Hillman might become the new Secretary of Labor.

It is certain that the discarded vice-president, Henry A. Wallace, will have to be provided with a suitable job, as will Robert Hannegan, Chairman of the Democratic National Committee.

Nelson In China

Nelson's trip to China "to set up a new WPB there," is reported to be actually aimed at increasing China's alcohol and steel output. Nelson was accompanied by five steel experts, headed by Herbert W. Graham, Jones & Laughlin's research director. These men may be instrumental in lifting China's steel output, now at 12,000 tons.



Resourceful Seabees—Highly skilled Navy Seabees can not only operate the various types of equipment with which they are provided, but in a pinch they can make machines out of spare parts and scrap metal. This electric hammer was made from odds and ends rescued from the scrap heap

Dual Unionism Looms as Major Postwar Labor Problem

Toledo-Detroit walkout involving 18,000 workers shows what may happen as competing unions seek same members. Issue is unsettled between M.E.S.A. and C.I.O.

CLEVELAND—The explosive issue of dual unionism, potential source of bitter labor disputes and severe work stoppages, was de-fuzed, although hardly removed, with settlement of the latest strike of Mechanics Educational Society of America. The Toledo-Detroit walkout, which affected 18,000 key workers in 49 war factories, was called off by the M.E.S.A. after a Presidential order for Army seizure of eight Toledo plants, which lasted only a day. While none of the principals would reveal the basis for the settlement, it was clear that the M.E.S.A. had received assurances that its existence would not be further attacked, for the time being at least, over the dual unionism issue.

Six Workers Badgered

Origin of the dispute was the dismissal by Electric Auto-Lite Company in Toledo of six workmen who hoped to avoid badgering by paying dues both to the C.I.O. United Automobile Workers and the M.E.S.A. The U.A.W., having exclusive representation under the government-sponsored maintenance-of-membership contract, notified the company that the six were "not in good standing," and the management had no choice but to fire them.

Prior to this action of the U.A.M., maintenance of membership had been primarily a dues-collecting arrangement, insuring the income of the union officials, not designed as a weapon against other unions. In protest, M.E.S.A. members struck in Toledo and Detroit, and 28,000 more in Cleveland were poised for a walkout when the order for Army seizure brought peace. The Army's position was bolstered by a threat to re-examine the draft status of the idle workers.

War Labor Board Helpless

The role of the War Labor Board was confined to an impotent order for the strikes to return.

In annnouncing the outcome of the M.E.S.A.-company-U.A.W. conferences which resulted in the return-to-work order, the C.I.O. union asserted that the M.E.S.A. was "simply out on a limb and had to retreat." Inside word was, however, that the C.I.O. leaders recognized the unfavorable light in which they were placed before the public by provoking a strike over the issue of whether a member might belong to another union.

The strike demonstrated that public agencies have no power to prevent such expulsions for the offense of belonging to two labor organizations. Some 30 other Auto-Lite employees, in addition to the discharged six, were subject to dismissal for the same reason. While they are now back at work, they are still subject to C.I.O. union discipline for "activity detrimental to the best interests of the union," the extreme penalty for which would be lifetime suspension from the organization and difficulty in getting a job.

Thus, while the dual unionism issue may, as a result of this flare-up, lie dormant for the duration of the war, the M.E.S.A. and other independent unions sooner or later face a fight for their lives.

Gear Manufacturers Study New Standards and Technical Topics

CHICAGO—Carbide hobs cut a deep impression on members of the American Gear Manufacturers Association attending the 27th semi-annual meeting at the Edgewater Beach Hotel, October 30-November 1. The subject was broached by Lt. Alfred J. Kroog, USNR, in a paper on the application of this type of tooling to marine propulsion gears. Richard W. Righter, Navy engineer, was co-author of the paper.

Lt. A. J. Kroog

F. C. Rushing

Lt. Kroog described the design of the Navy-sponsored hob and its successful use at the Joshua Hendy Iron Works on a Gould & Eberhardt machine. The discussion that followed brought out wide differences of opinion. Harold Falk, Falk Corporation, stated that his concern had made much better production records with high-speed steel hobs than those to which the carbide hob was compared in the paper. Louis R. Botsai, Westinghouse Electric & Mfg. Co., A.G.M.A. president, was chairman of the meeting.

Contact Temperature

An able presentation of "Worm Gear Contact Temperatures" was made by Geo. H. Acker, vice-president, Cleveland Worm & Gear Co. An ingenious arrangement in Mr. Acker's experimental set-up used the worm and worm wheel materials also as thermocouple materials. It was found that an air blast on the oil reservoir wall surface greatly reduced contact temperature.

George Acker R. W. Righter

That bugaboo of gear engineers, vibration, was attacked by F. C. Rushing, Westinghouse Electric & Mfg. Co. Mr. Rushing demonstrated that vibration is subject to mathematical analysis and that it can be isolated by suitable detection instruments. He offered some helpful suggestions for its elimination.

With contract termination growing in volume an address on the subject by Lt. Col. Francis W. Parker was particularly timely. Col. Parker explained that all companies with government contracts should become informed on correct procedures so they can move immediately on termination. The government's aim is to effect a speedy and reasonable settlement, he said.

Lt. Col. Parker

Spline Standardization

Technical committees were extremely active and pushed forward the work of standardization. A recommended practice on involute splines compiled under the chairmanship of Charles R. Staub, Michigan Tool Co., was accepted by the association to speed its use in current designs.

Inside Detroit

Artillery Tools Needed

As the serious lag in war production continues unabated in this and surrounding areas—reaching crisis proportions in heavy artillery, heavy ammunition, and heavy-heavy trucks—talk of drastic government emergency action was lent considerable credence by the appearance here last week of a number of important Washington officials. In an all-day session with manufacturers of items in which production was running behind schedule, officials emphasized the gravity of the situation and encouraged open discussion of individual problems.

The principal reason for his visit was the necessity of locating immediately 2,000 additional machine tools for the heavy artillery and ammunition programs. For that purpose, primarily, he was spending a day each in Cleveland, Detroit and Chicago.

Truck Production Handicaps

An equally important cause of concern in this region has been the serious retardation of heavy-heavy truck production. The problem, as the manufacturers see it, is very clear-cut. Manpower is the crux—manpower, that is, in supplier foundries, forge shops, and heavy-duty tire plants, not manpower in the truck plants themselves. They, the truck manufacturers, are well enough off in that respect owing to their reasonably high wage scale and to recent extension to them of special manpower priority ratings.

Heavy Castings Short

Heavy castings and heavy forgings (particularly crankshafts), are two of the three stumbling-blocks. In forge shops and foundries producing them, wages were frozen by the Little Steel formula at levels considerably below those of neighboring war plants competing with them for a pitifully inadequate labor supply.

Truck manufacturers quickly foresaw in this situation a source of danger which would increase steadily as the draft continued to take away experienced foundry and forge shop workers and the scarcity of even the greenest replacements became steadily more acute. As early as June, 1943, they notified W.P.B., warning of an approaching production breakdown and advising a modification of the Little Steel formula to prevent it.

Foundry Wages Frozen

Foundry wage rates in this region, they pointed out, were frozen in the 78c-95c range—forge shops 95c-$1.10—whereas most war plant rates averaged $1.15 or more. In addition working conditions in the foundries and forge shops, far from being a compensating enticement, were very discouraging to prospective employees. Few improvements had been made in the preceding decade and the unenviable reputation the shops in this area had apparently picked up during the depression was catching up with them now.

However, for some time nothing was done in Washington. Demand for heavy trucks mounted to two and three times previous peaks. Demand for heavy forgings and castings swelled proportionately. The foundries and forge shops, struggling to produce the material with dwindling help, were further hampered by the greenness of a large number of their workers. Rejects started running around double to three times the norm. Output dropped to 60 per cent of capacity.

More recently foundrymen engaged in production of castings badly needed by the truck manufacturers were invited to state their problems in a series of conferences with various government agencies. In the opinion of various truck manufacturers, the foundrymen deliberately played down the importance of the manpower issue in order to avoid "spot" wage increases which would boost their costs and cause them to lose profitable business to rival foundries in other areas during the reconversion period.

Tire Output Limited

The other snag in truck production is heavy-duty tires. Here, of course, the delay may be laid directly to union policy, which sets a rigid limit on per capita output, whatever the wage level. In effect this frequently means a 20 to 25 per cent cut in the productivity of every man. What it amounts to is willful, but unfortunately legal, reduction of the available supply of manpower.

Clean up these three manpower bogs, say the truck manufacturers, and truck production will hit its mark. Leave them the way they are and no improvement in the situation will be forthcoming.

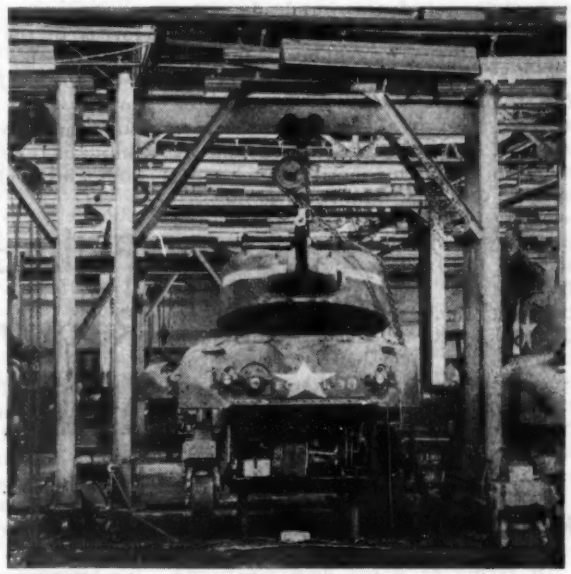
Plant Clearance Progress

Meanwhile brighter strains continue to be woven into the Detroit industrial chiaroscuro, side by side with those of more somber hue. The Defense Plant Corporation is buying 6,000,000 square feet of demountable corrugated iron warehouse space, much of which will be used in the Detroit area for the storage of government tools and equipment after V-E day. Some plants are being cleared of surplus machinery.

OHIO WAR BUSINESS UNAFFECTED BY CUTS

CLEVELAND — The third quarter 1944 report for the Cleveland Ordnance District reveals that new contracts have more than offset cutbacks in this area. At the end of September, 1944, this District had 2,579 prime contracts and purchase orders with a value of $2,491,000,000, which was $171,000,000 greater than the contracts outstanding at the end of June 30th, and $300,000,000 greater than those on March 31, 1944.

Although 665 contracts have been terminated in the district since the start of the war, as many as 10 new contracts daily were awarded during the third quarter of 1944.



Reclaimed Tanks — Used tanks are being renovated at Chrysler's Evansville plant with the aid of large A frames to lift turrets and other heavy parts during overhauling

Spotting the Air News

Carriers Speed Sea War

Blitz war on land is now understood by everybody, but few appreciate the new lightning war at sea. In fact, the Navy can attack with surprise and speed greater than that of land air forces, in many situations, because, to the speed and range of the airplane is added the mobility and range of the aircraft carrier. Task forces and fleets, spearheaded by carriers, accompanied by combat ships and swift supply vessels, can stay in combat zones for weeks, thousands of miles from base, is and strike at dawn, hundreds miles from the place where last seen at dusk.

Most attacks on enemy ships are made by bombers and torpedo planes far from their own ships. Most of the action in the great American victories at the Philippines was carried out by aviation, though there were some surface contacts. The Navy is now essentially a sea-going air force, and probably it will continue in that trend. Heavy, long-range airplanes will be flown from the new carriers now building. Fuel is now transferred under full headway, and so is ammunition, a thing never before dreamed of. Speed and power and freedom of action and long reach have changed the Navy to a new kind of weapon, and all these are being improved in a constant sequence of invention.

Maintaining Naval Superiority

In terms of naval equipment and operations in the Pacific today, the United States Navy is not only the world's biggest by long odds, but it is the only navy in the strictly modern sense. This navy was developed, with almost unbelievable construction speed, out of necessity to meet the Japs in superior force, they on their home ground and we based thousands of miles away. The Japanese Navy has been reduced by losses to a third rate organization, even in terms of pre-war sea power. The British Navy is by no means comparable to the U. S. Navy, partly because England did not need sea blitz for her role in the war, and partly because the Empire does not have the industrial resources to produce such a navy. All other sea forces in the world are negligible by comparison.

Of course Russia, or England,—any country that wants to, can in future build modern naval-air power, to the limits of their will and resources. Most countries including this one probably will have not have sufficient motivation to do so in peacetime. Probably the one we now have will be allowed to stand at status quo, trailing technical possibilities. Only a strong research program, fully supported by the people, can maintain either the Army or the Navy abreast of a maximum progression in technology.

Naval Aviation Possibilities

The possibilities in Naval aviation, further developed as it can be with Jato (jet assisted takeoff); air-borne rockets, which give aircraft the striking power of heavy artillery with many times the range and speed; jet-turbine power plants for aircraft; new concentrated (atomic energy) fuels which may permit complete revision of war strategy and logistics; troop carrier operations, with aircraft built to fly every weapon and equipment unit that armies use on the ground, which may well be allocated to the marines for triphibious use—the possibilities are so interesting and so terrible that one wonders whether men will still go in for war or shun it like death.

Philippine Rehabilitation May Require $500,000,000 of Equipment

SAN FRANCISCO—American business men who were forced out of the Philippine Islands by the Japanese invasion are making plans to return to the Islands at the earliest date possible, to salvage and rehabilitate their pre-war enterprises.

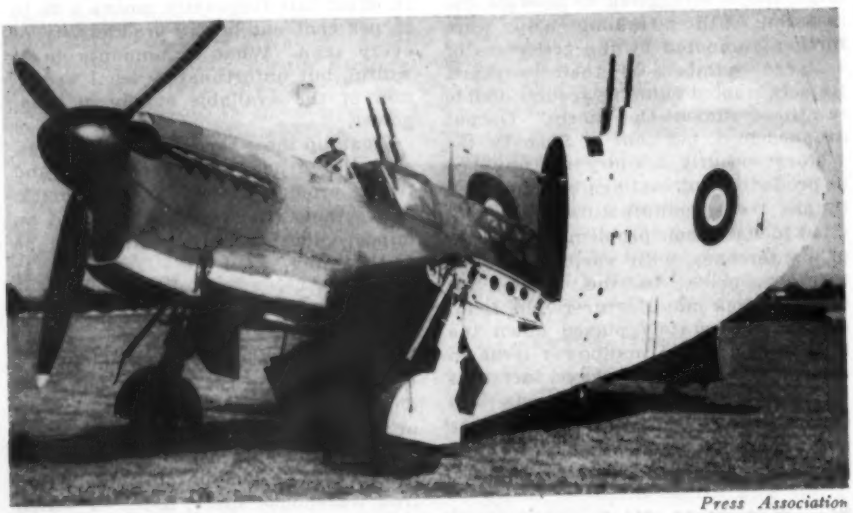
These men, many of whom are making temporary headquarters here, estimate that at least $500,000,000 worth of equipment will be required to restore war-wrecked business of the archipelago. Much equipment, notably mining equipment was deliberately wrecked to keep the Japs from using it, and it is assumed that the Japanese will, in turn, "scorch the earth."

Major pre-war industries of the Philippines were mining, sugar, hemp, vegetable oil, and tobacco. Machinery for the restoration of these industries will be needed, as will, also, large numbers of automobiles, tractors, railroad equipment, and all kinds of household and office equipment. It is supposed that these and thousands of other items will be needed to restore the country to its pre-war status.

Pre-war Status High

That pre-war status, by Oriental standards of living, was a very high one. With the advantage of free-trade with the United States, the total of imports and exports, the two being approximately in balance, between this country and the Philippines was around $200,000,000 annually in the years just before the war. Second place in trade with the Islands was held by Japan, and the hemp industry in particular was to a large extent controlled by Japanese interests.

Naturally, the question of trade with the Philippines is involved with political considerations, but those who know the islanders best assume that a close economic relationship will continue with United States despite post-war political independence plans.



Press Association

New Jap Headache—This new British fighter-reconnaissance plane, the "Firefly," is now in service with British carriers in the Pacific. Fitted with four 20mm guns, the Firefly's wings fold back in parallel position

Prices Set for Canadian Government-owned Tools

OTTAWA—Machine tool sales by War Assets Corporation have been placed on a new pricing basis under direction of Munitions and Supply Minister C. D. Howe. The new basis takes into account the high cost of war plant equipment, much of which was imported from the United States, compared with prewar and probable postwar costs of similar equipment and the use to which equipment has been put.

The price structure fixes floor prices at 68.2% of the Canadian cost less depreciation at the rate of .9% of such cost per month of use, provided that the depreciation allowances do not reduce the price to less than 25% of the Canadian cost. This cost is to include exchange, duty, and excise taxes, paid or payable or exempted, remitted or refunded but is not to include transportation and installation costs.

To facilitate prompt employment of all available war plant equipment in reconversion Howe has authorized transfer to War Assets Corp. for disposal of machine tools which have not yet been declared surplus but which are not being fully utilized in war production operations. These will be sold on the same price terms as tools declared surplus but will be subject to repurchase by the government should the need arise. Many firms have applied for them.

Disposal Committees Set-up

War Assets Corp. is organizing committees from all branches of industry to work with it in the carrying out of war assets disposal policy. Sale of war goods in Canada will be almost entirely through regular trade channels and in accordance with regular trade practices. Trucks, for example, will be reconditioned and offered for sale under the same conditions as used civilian trucks are dealt in by outlets for the automotive industry. Sales will be under ceiling prices prescribed by Wartime Prices and Trade Board.

50 Percent VE Cut

Although an official statement which Howe was to have made in early October on plans for cutbacks in war production and dropping of parent war controls at the end of the German war has been delayed owing to the changed military situation and the lack of urgency for it, the plans have not been altered. They still call for reduction in war operations by at least 50% and scuttling of virtually all controls over industry and materials. The difference is that reconversion moves are now centering on action before V-E Day.

The green light for civilian production is already being given to a number of industries, including steel and aluminum. At the same time, civilian production and standardization restrictions are being rapidly removed. Practically all metal products industries are now free of them except those which have to obtain components from the United States, such as refrigeration, washing machines, vacuum cleaners, machinery. With these durable goods still under control in the U. S., Ottawa feels obliged to retain controls in Canada in order that U. S. authorities will know the uses to which American components sold to Canadian firms are to be put. But under a new Ottawa-Washington arrangement Canadian firms have access to WPB spot authorization permits on the same conditions as U. S. firms.

Farm Machinery Bottlenecked

Current farm machinery production is meeting only about 25% of the demand. Chief bottlenecks are malleable iron castings and manpower.

Steel Company of Canada, which recently announced plans for installation of a big hot strip mill, now discloses that it will add cold-rolling mills and finishing facilities to complete diversification which will extend the range of its production and improve service to users of flat-rolled steel.

Names in the News

F. J. Knack

Frederick J. Knack has been named vice president in charge of engineering of the Luscombe Airplane Corp., Trenton, N. J. Mr. Knack was vice president and chief engineer for the firm for five years, but since 1942 he has been associated with the Fairchild Aircraft Div., Fairchild Engine & Airplane Corp. In the past 20 years, Mr. Knack has been associated with several of the larger airplane companies in various capacities and is known as an aeronautical engineer and designer of famous aircraft.

Arthur P. Emmert, former vice president in charge of manufacturing, has been named president of Warner Gear Div., Borg-Warner Corp., Muncie, Ind. Mr. Emmert succeeds **C. S. Davis,** who has headed Warner Gear since 1932, and who will return to Chicago and the parent company. At the same time, **E. S. Russey** has been appointed vice president and general manager, succeeding **John M. Simpson,** who will serve as chairman of the supervisory board. Also, **J. O. Moore** has been named the new works manager.

Omer L. Woodson has been appointed vice president and general manager of the Ryan Aeronautical Co., San Diego, Calif. For the past five years, Mr. Woodson has been vice president of Bell Aircraft Corp., and since 1942 general manager of its Marietta, Ga., bomber plant. Prior to his association with Bell, he was with the Curtiss-Wright and Douglas aircraft companies.

Arch A. Warner has been elected president and general manager of Borg-Warner's Rockford Drilling Machine Div., Rockford, Ill. Mr. Warner succeeds **E. C. Traner,** who is retiring after more than 25 years with the firm to become chairman of the board.

William F. Henderson has been named vice president and general manager of the Clearing Machine Corp., Chicago, Ill. Mr. Henderson has been an executive of the Briggs Manufacturing Co., Detroit, Mich., for the past 10 years, and prior to that was with the Maxwell Motor Car Co.

Herman F. Zorn

Herman F. Zorn has been elected president of the V. & O. Press Co., Hudson, N. Y., to succeed **Thomas I. Shriver,** president for the past eight years, who has been named chairman of the board. Mr. Zorn, who has risen to the presidency after starting with the firm 21 years ago as toolmaker, has been, successively, shop superintendent, sales manager and vice president.

Theodore S. Bonnema, former production manager, has been named vice president in charge of production of the Oster Mfg. Co., Cleveland, Ohio.

John D'Agostino, until recently a member of the Brazilian Military Commission purchasing staff in Washington, has been appointed South American representative of the Simmons Machine Tool Corp., Albany, N. Y. Mr. D'Agostino will make his headquarters in Rio de Janeiro, Brazil.

Emerson D. Lapsley has been named manufacturing manager of Bell Aircraft Corporation's Ordnance Div., Burlington, Vt. Prior to joining Bell in 1936, he worked for Consolidated, Curtiss-Wright and Hall Aircraft. For the past two years he has been factory manager of the fabrication plant of Bell's Niagara Frontier Div. in Buffalo, N. Y.

Samuel Gahan has retired as teacher of machine shop practice at the Machine and Metal Trades High School, New York, N. Y. Mr. Gahan has contributed, in the past, many articles to this paper on toolmaking and machine shop training and now plans to devote his time to the advancement of vocational education.

L. V. Nagle, Michigan sales manager for the Udylite Corp., Detroit, Mich., for the past 13 years, has been appointed vice president in charge of national sales for the firm.

Norman E. Thompson has been appointed manager of the nine plants making up the eastern division of the Rheem Mfg. Co., New York, N. Y. Prior to joining Rheem last January, Mr. Thompson was with Republic Steel Corp.

BUSINESS ITEMS

E. C. Atkins and Co., Indianapolis, Ind., have moved their New York offices to a new location at 233 Broadway, 2279 Woolworth Bldg., New York 7, N. Y. They have closed their New York City warehouse and have established distributors and jobbers in the New York territory which will carry the Atkins products in stock. The company will continue to operate in the territory as it did previously except the branch will not carry any stock of goods.

United States Rubber Co. has arranged to purchase the assets and business of the **L. H. Gilmer Co.,** Philadelphia, Pa. No change in the management or operations is planned and **John S. Krauss,** president, will continue in the active management of the business.

Dresser Industries, Inc. will move its headquarters from Bradford, Pa. to Cleveland, Ohio where the executive offices will be located in the Terminal Tower.

Kennametal, Inc., Latrobe, Pa. has moved its Detroit branch office to larger quarters at 5531 Woodward Ave. with **Bennett Burgoon, Jr.** as district manager in charge.

Joshua Hendy Iron Works has reopened its San Francisco sales office in the Flatiron Bldg., 544 Market St.

Continental Can Company's central division office in Chicago will move from the Conway Bldg., 111 West Washington St. to the Field Bldg., 135 So. LaSalle St. on or about Dec. 1.

Dynamic Air Engineering, Inc. recently acquired the properties and uncompleted contracts of the **Steel Forming Corp., Los Angeles.** The new plant will be designated as Plant 1 and will contain the corporation's general and executive offices.

Sterling Alloys, Inc., Boston, Mass., have appointed three new field engineers in various territories. They are: **John Sonnenfeld,** 206 7th St., Keokuk, Iowa, to cover Mo., Western Iowa, southern Ill., Kans., and Nebr.; **A. C. Woolley,** Terminal Sales Bldg., Portland, Ore., for Ore. and Wash.; **G. Dell,** 314 W. Bloom St., Louisville, Ky., in Ky., southern Ind., including Evansville.

Cutler-Hammer, Inc., Milwaukee, Wis., has opened a sales office at 108 No. Main St., South Bend, Ind., with **Terry Fisher,** South Bend representative, in charge.

Taft-Pierce Manufacturing Co., Woonsocket, R. I., has acquired from the **J. & H. Electric Co.,** Providence, R. I., all rights, titles and interest in D. & W. magnetic chucks and J. & H. demagnetizers which will be incorporated into the Taft-Pierce line of Superpower magnetic chucks and demagnetizers. Taft-Pierce will also service all J. & H. equipment now in operation.

OBITUARIES

Nicodemus Bosch

Nicodemus Bosch, founder of the Western Machine Tool Works, Holland, Mich., passed away at the age of 81 on Oct. 22. Mr. Bosch, who served as president and general manager of the company for 40 years, had been ill for several months. Prior to the incorporation of the Western Machine Tool Works in 1902, he and two associates had organized the Valley City Machine Works in Grand Rapids.

Fred W. Pintzke, who founded the Superior Bearings Corp. in 1921 in Indianapolis, Ind. died recently at the age of 70.

J. W. Sullivan, 73, chairman of the board of Skilsaw, Inc. died Oct. 26 at his home in Evanston, Ill. Mr. Sullivan was the founder of the firm and became its president in 1926. He retained that position until 1942 when he was named chairman of the board.

John P. Rentschler, 56, died Oct. 31. Mr. Rentschler was a sales engineer for the Interstate Machinery Co., Chicago, Ill., for the last three years. At one time, he was works manager for the Consolidated Machinery Co. and he later was the owner of a machinery firm bearing his name in Chicago.

George H. Pratt, sales manager of the Cushman Chuck Co., Hartford, Conn., for 20 years prior to his retirement in 1937, passed away Oct. 21.

Rowland Riehl, general manager of the Davis Boring Tool Div. of the Larkin Packer Co., St. Louis, died at his home there on Oct. 22.

J. J. Larkin, president of the Larkin Packer Co. and the Davis Boring Tool Div., St. Louis, passed away at his home in St. Louis Oct. 23.

Lloyd Brown, 68, president of the Duplex Manufacturing & Foundry Co. of Elyria, Ohio, died Oct. 25 after a year's illness. Mr. Brown was associated with the Lakewood Engineering Co. for 26 years, ten as president, before he purchased the Duplex company, then a subsidiary of the Lakewood firm.

James L. Lucas, 89, founder and president of J. L. Lucas & Son, Inc., Bridgeport, Conn., died Oct. 19 in Florida. Mr. Lucas was known as a pioneer in rebuilding machine tools.

Arthur V. Carroll, 69, retired machine tool manufacturer, died at his home in Cincinnati, Ohio, recently. Mr. Carroll was the founder, president and general manager of the Carroll-Jamieson Machine Tool Co., Batavia, Ohio.

MEETINGS

American Society of Mechanical Engineers. Annual Meeting. Pennsylvania Hotel. New York, N. Y. Nov. 27-Dec. 1. Ernest Hartford, Executive Assistant Secretary, 29 West 39 St., New York, N. Y.

National Association of Manufacturers. Reconversion Congress of American Industry. Waldorf-Astoria Hotel. New York, N. Y. Dec. 6-8. Robert M. Gaylord, President, 14 West 49 St., New York 20, N. Y.

National Exposition of Power and Mechanical Engineering. Madison Square Garden, New York, N. Y. Nov. 27-Dec. 2. Charles F. Roth, Manager, 480 Lexington Ave., New York 17, N. Y.

Society of Automotive Engineers. Annual Meeting. Book-Cadillac Hotel, Detroit, Mich. Jan. 8-12. John A. C. Warner, Secretary & General Manager, 29 West 39 St., New York, N. Y.

Society of Automotive Engineers. National Air Cargo Meeting. Hotel Knickerbocker, Chicago, Ill. Dec. 4-6. John A. C. Warner, Secretary & General Manager, 29 West 39 St., New York, N. Y.

Shop Equipment News

Warner & Swasey Announces Attachments to Speed, Ease, Simplify No. 5 Universal Turret Lathe Operation

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio, has announced three new supplementary attachments for its No. 5 Universal turret lathe.

Thread chasing attachments provide an inexpensive arrangement for cutting threads with the cross slide. They are said to be easily and quickly installed and simple to operate. They provide a means for cutting any standard pitch from 4 to 32 threads per in. Each leader and follower will cut one thread when using standard gears in the head end gear box. Threads may be cut to 6½ in. length. These attachments are available with or without automatic knockoff; the former will disengage within 0.002 in.

The new electric collet chuck booster enables the operator to close and open collet chucks with minimum effort. Booster power is supplied by a motor with worm drive, through a multiple disc clutch which is engaged by a slight movement of the collet operating lever. A safety link prevents damage to the collet chuck mechanism if it is set too tight. The electric collet chuck booster attachment replaces the collet lever bracket and can be quickly installed.

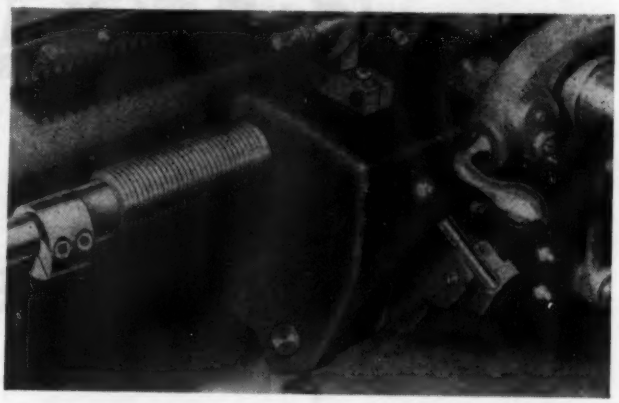
The full Universal threading turret lathe can be equipped with a selective quick change gear box or a pick-off gear box for a threading range of 2 to 56 threads per in. in lengths up to 21 in. Right or left hand threads may be cut.

Eutectic Develops Alloy Powder Tool Tipping Method

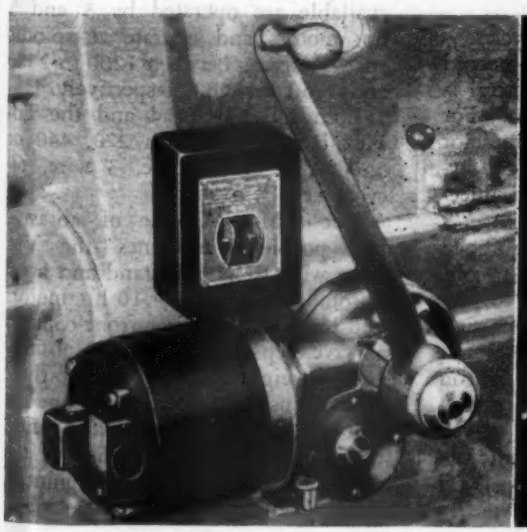
Alloys in powder form for cementing tips to carbide and high speed steel tools, developed by Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y., are said to present definite advantages over the use of silver foil brazing.

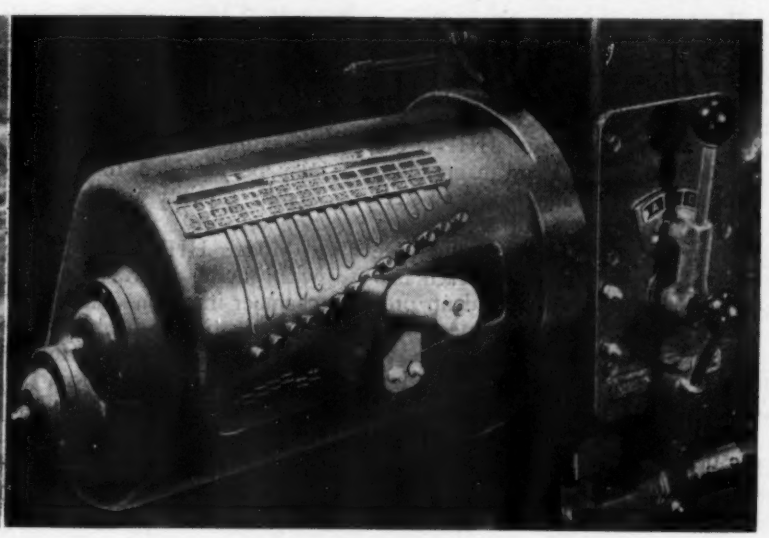
Two silver-copper and one copper alloy used for tipping tungsten carbide and high speed steel tools are now available in a fine powder. Their use is said to be more economical, since the required flux is mixed with the powdered alloy and since it is not necessary to cut the foil into small pieces and exactly preplace.

Eutecrod 1800, lowest melting, is for high-speed steel and oven heats between 940 and 1140 F. No. 1601, high tensile, is for tungsten carbide heats between 1020 and 1250 F. No. 16, high resistant, high tensile, is for tungsten carbide working between 1300 and 1750 F.



Warner &Swasey supplementary attachments for its No. 5 Universal turret lathe: thread chasing attachment, right; electric collet chuck booster, lower left; and, lower right, selective quick change gear box





Barnes Rotary Pump Designed To Pump All Lubricants

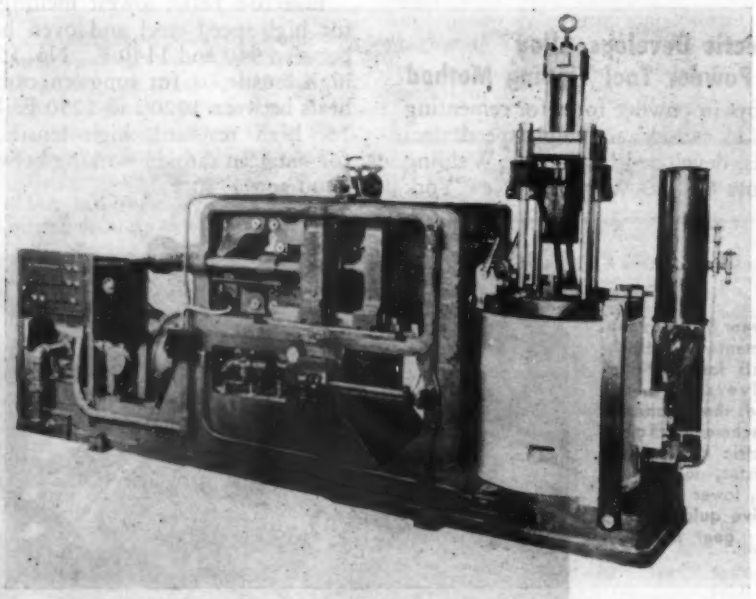
A low pressure, rotary pump, designed for industrial application and said to afford an efficient and economical method for pumping all types of liquids having lubricating qualities, has been announced by John S. Barnes Corp., Rockford, Ill. Capacity of the pump ranges proportionately from 1 gal. per min. at 600 r.p.m. to 4 gal. per min. at 2,400 r.p.m. It has a high volumetric efficiency pumping extremely low viscosity fluids.

A feature of the pump is the patented spur gear tooth form, said to eliminate excessive sliding and reduce slippage of the fluid to an absolute minimum.

Protection against excessive pressures is afforded by a relief valve, adjusted and set at the factory under its intended operating conditions.

Self-priming is a feature of the Barnes pump and all moving parts are self-lubricated. The pump is precision machined throughout and can be easily assembled and taken apart; socket head screws are used in assembly. It can be bolted onto any machine in positions to suit the power take-off. Maximum pressure range is 200 psi. and tests show that vacuum to 26 in mercury gage is feasible.

Lester-Phoenix Die Casting Machines Announced for Zinc, Tin, Lead, Aluminum, Brass and Magnesium



Lester-Phoenix HHP-1 die casting machine

Lester-Phoenix Inc., 2711 Church Ave., Cleveland, Ohio, announces two new fast-cycling, high pressure die casting machines: HHP-1 for zinc, lead and tin and HHP-1 CC for aluminum, brass and magnesium.

Each type has a one-piece cast-steel beam type frame rated at 150 ton locking pressure. Direct motor drive to hydraulic pumps makes each machine a complete independent production unit. Die movement and positive locking is by means of heavy double toggle links and pins, hydraulically actuated.

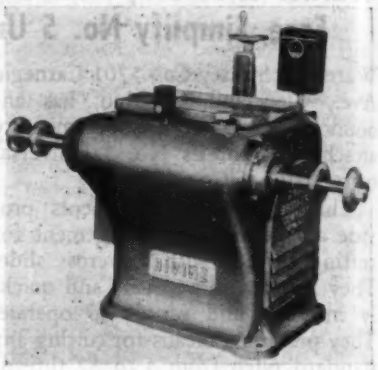
Rapid cycling rate provides 400 to 500 shots per hour. Cycle timing is by three electric time clocks, insuring exact repetition of the selected injection and die movement cycles.

In Model HHP-1, the submerged plunger injection of molten metal is by positive hydraulic actuation. For either model, a nitrogen accumulator may be provided for additional hydraulic capacity and increased injection velocity.

Model HHP-1 CC is equipped with Lester "slow squeeze" cold chamber injection system said to produce castings capable of passing X-ray examination. Molten aluminum is hand ladled from the silicon carbide pot directly into the ported injection cylinder. It is then driven into the die by the hydraulically actuated plunger under 1,000 psi. oil pressure at slow speed.

J. & S. Form Checkers Reduce Grinding Loss, Save Wheels

Form-Checkers, for making the trial cut in work before the form has been checked for accuracy, or for checking during the grinding operation, are available in packages of 50 from J. & S. Tool Co., 477 Main St., East Orange, N. J. They are made from a tough, non-burring, plastic material that takes a clear, sharp outline without wearing down the wheel form.



Divine Lo-Flex lathe

Divine Variable Speed Lathes And Belt Polishing Machines

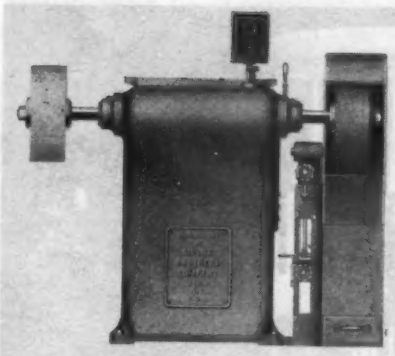
Divine Brothers Co., 102 Whitesboro St., Utica 1, N. Y., has announced four new machines: the Flexspeed and the Lo-Flex lathes and two sizes of abrasive belt polishing machines.

The Flexspeed lathe provides speed ranges, in its different models, varying between 1200 and 2500 r.p.m. and 1750 and 3500 r.p.m. It is available in 3, 5, and 7½ hp.

The Lo-Flex lathe is described as combining the advantages of the Low lathe, at which the operator works while seated, with those of the Flexspeed lathe. The two models available are operated by 3 and 5 hp. motors and operate at spindle speeds varying between 1200 to 2500 and 1750 to 3500, respectively.

Both the Flexspeed and the Lo-Flex lathes operate on 220, 440 or 550 v., 2 or 3 phase, 3 wire, 60 cycle a.c.

The VM-DBX line of abrasive belt polishing machines—the VM lathe with BDX backstand and hood—come with 5, 7½ or 10 hp. motors and have minute-miser front controls to save steps and time. The positive counterweighting is designed so there is an adjusting feature to change the belt tension to produce most effective cutting action. Features of the machine are: positive alignment, simple adjustment, smooth, vibra-



Divine VCS-DBX belt polishing machine

tionless operation and minimum maintenance.

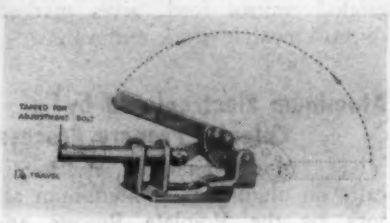
The VC-DBX abrasive belt polishing machine is a companion to the VM-DBX. Either the VM-DBX or the VCS-DBX can be supplied equipped for variable speed in two ranges: 1200 to 2500 r.p.m. or 1750 to 3500 r.p.m. The VC lathes come with 5 or 7½ hp. motors. The self-aligning, pressure-lubricated, bearings of this line are described as maintenance-free, while automatic V-belt adjustment eliminates production interruptions and slow-downs.

De-Sta-Co Push-Pull Lock Clamp for Locating, Indexing

De-Sta-Co Model 605 toggle clamp has been added to the line of the Detroit Stamping Co., 343 Midland Ave., Detroit 3, Mich. According to the manufacturer, the clamp is especially well suited for locating and indexing.

The work end of this clamp is tapped to receive a ⅜ in.-18 standard threaded bolt, which provides quick adjustment to suit the job at hand. Travel distance of plunger rod is 1¼ in.

By simply re-locating one of the handle bolts with a screw driver, the clamp can be converted from "push" to "pull" action. It weighs 9 oz. and when in "push" locked position measures 5½ in. long, 2¼ in. wide and 2-25/32 in. high. When used as a "pull' clamp, in locked position it is 7-1/16 in. long, 2¼ in. wide and 2½ in. high.



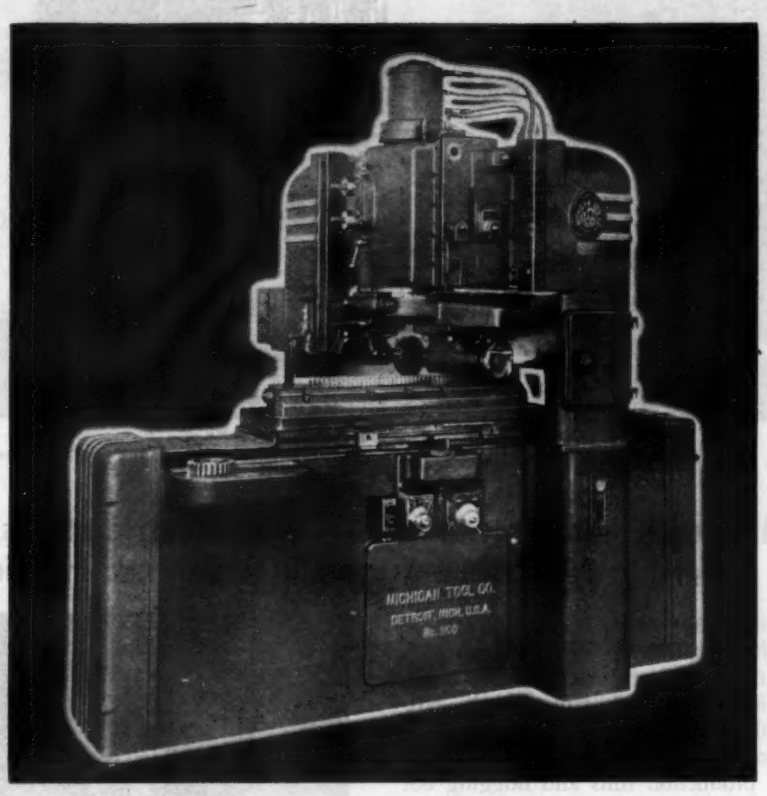
De-Sta-Co push-pull lock clamp

Griffin Lengthens Thread Gage Life by Welding Alloy

New thread gages are constructed and old ones salvaged by a welding process announced by the George O. Griffin Co., 1300 W. Hadley St., Whittier, Calif. Worn gages are reclaimed by removing the threads and welding on a solid deposit of chrome-carbide alloy, then grinding new "on size" threads in this wear-resistant deposit. New gages are similarly constructed by welding the alloy on specially prepared blanks. Threads are ground in the solid and are of chrome-carbide alloy from the crest of the thread to well below the root.

Griffin processed thread plug gages can now be furnished in sizes from ⅜ in. and larger, thread ring gages in sizes of ⅞ in. and larger.

Michigan Tool Company Rack-Type Crossed-Axis Gear-Finishing Machine Has Two Hydraulic Systems



Michigan new 900 rack type finisher

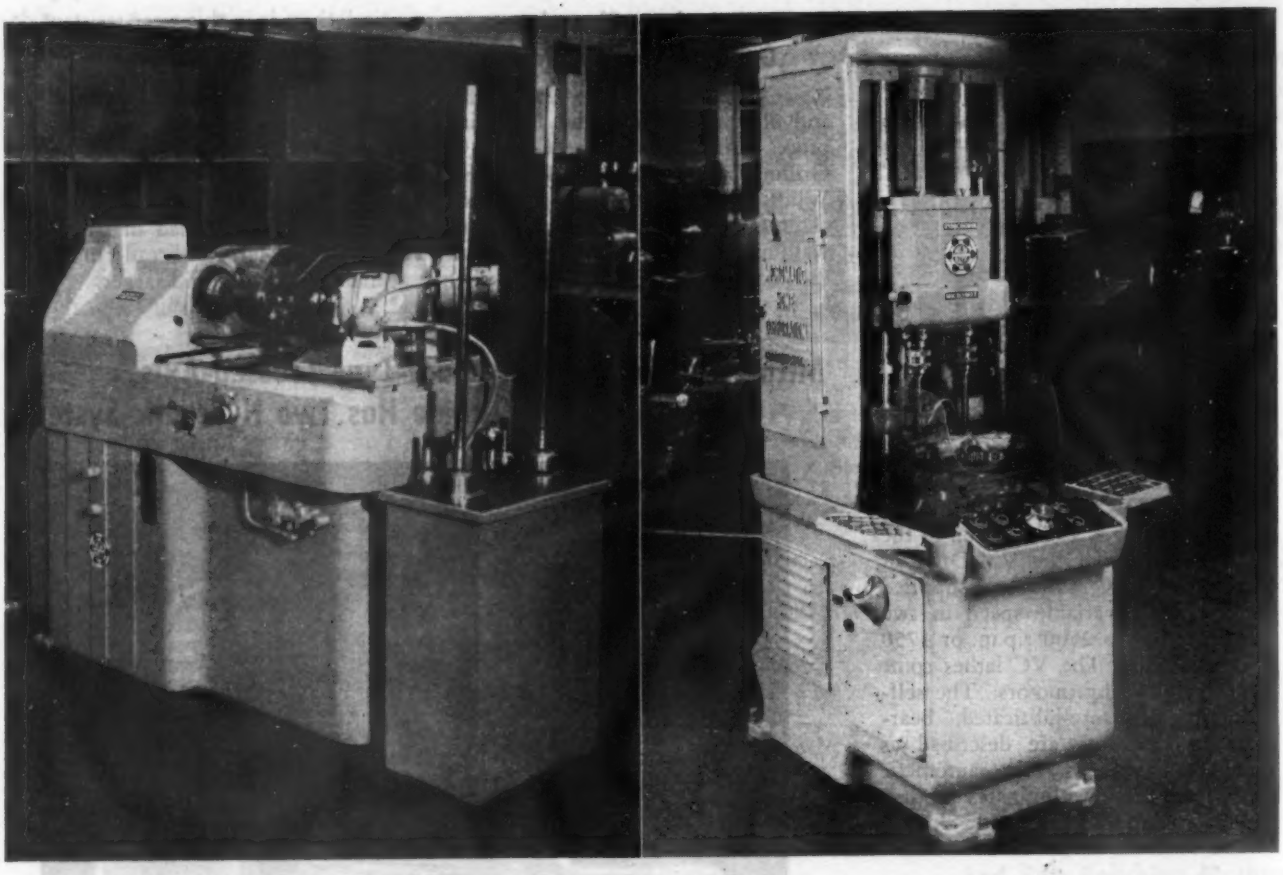
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich., has announced an improved "Postwar" line of its series 900 rack-type crossed-axis gear-finishing machines. Completely hydraulic in operation, the new series incorporates two separate hydraulic systems, one for the operation of the table and one for the head feed.

Separate outlets for lubricants and coolants effectively reduce chance of cross contamination and permits the ready use of coolant coolers. Automatic lubrication has been extended to the rack table ways, which are of hardened and ground dovetail design.

During the cutting cycle the work is reciprocated at a predetermined rate of speed across the rack while the rack reciprocates longitudinally, in mesh with the work. Controls for both rates of speed are quickly adjustable. A positive counter is provided to regulate the number of finishing strokes desired after vertical feed has been completed to bring the work to correct size on pitch diameter.

The 900 series machine is designed to finish gears up to an 8 in. dia. with maximum length between centers of 18½ in.

Electrical controls have been improved from a safety and durability standpoint, with start and stop buttons stations and with operation on 110 v. The machine has been further strengthened by increasing base and column structural ribbing.

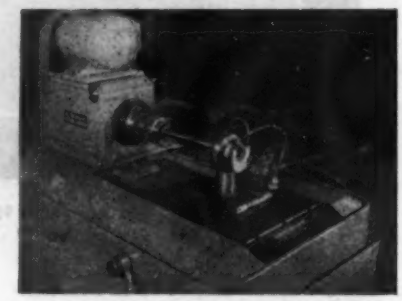


Micromatic ball stud honing machine, left, and vertical multiple honing machine, right, with six place indexing tables

Micromatic Introduces Plastic-Mounted Abrasive Stones, Simplified Tools and Automatic Gaging and Indexing

Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 4, Mich., announces a new line of honing machines and sticks, said to make possible automatic gaging of work in process, speeding and reducing cost of production runs and hogging out of heavier sections.

The new automatic Microsize control gages work automatically within tolerance ranges of 0.0003 size limits. Plastic end tabs of a new type of plastic mounted light-weight abrasive stone for honing tools pass inside a gaging ring with each stroke of the honing tool. When sufficient material has been removed from the inner diameter, the stones and their plastic tabs expand sufficiently to move the gaging ring, turning it sufficiently to actuate a solenoid and stop the operation. After rough honing the inner diameter, the work is mounted on an arbor and the outer diameter generated concentric with the honed surface; finally, the inner diameter is finish honed. The system is adaptable to both vertical and horizontal types of honing machines. It is said materially to reduce costs and production time on fine finishing.



Automatic Microsize control

Using Microsize control with newly announced multiple honing machines having six-place indexing tables, progressive honing of work on a production basis is possible. A new multiple-spindle vertical Hydrohoner for internal work has rotary indexing of work table with capacity from ¼ in. to 2 in. dia. It is said to be applicable to honing such as transmission gears, connecting rods and valve tappet holes. A different size ring gage controls each spindle. The table automatically indexes one station upon withdrawal of the last spindle; thereupon, honing automatically resumes and the operator unloads and reloads the station that has completed the cycle.

Hydrosizing, a system of pressure fluid gaging, is utilized by Microsize on larger work. Cutting fluid forced from jets against the cylinder wall reduces in back pressure as its diameter is enlarged. This system can be used either manually or made automatic through connection with a pressure switch.

A new type honing tool of simplified and stronger construction and having newly designed plastic mounted light-weight abrasive stones, has been developed. Recessed into the plastic, spalling of the ends and sides of the abrasive is minimized. The plastic is enforced with a steel underlying strip. A new Harz-Lite development of honing stone impregnation treatment, combined with Microdial control feed, gives marked improvement in stock removal.

Aluminum Electroplated by Colonial Prepare Process

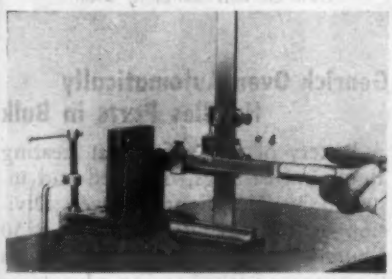
Silver can be deposited electrolytically on aluminum or aluminum alloys by the Preplate Process announced by Technical Processes Div.,

Colonial Alloys Co., Colonial-Philadelphia Bldg., Philadelphia, Pa. Silver deposits of considerable thickness can go directly onto the aluminum surfaces, or follow a copper, nickel, zinc or cadmium deposition. The aluminum is thoroughly cleansed, passivated, immersed in Preplate Solution for a few seconds, and then electroplated in the usual manner. Adherence is said to be good.

Somerset Layout Punch and Automatic Tapper Announced

Greater accuracy and speed in making prick marks are said to be assured with the new layout punch and automatic height gage tapper introduced by Somerset Tool Co., 220 Virginia St., Hillside, N. J.

The punch and tapper are designed for use with height gages, planer blocks and gage blocks. The conical point of center punch is described as being exactly in line with the base



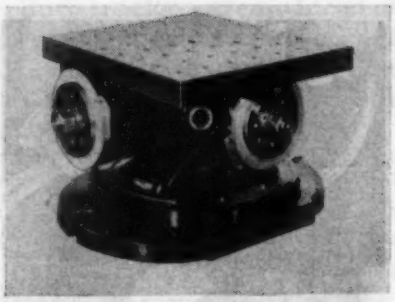
Somerset layout punch and tapper

of the holder. The scratch forms a 60 deg. included angle, 30 deg. each side of center, assuring precise vee grooves, the manufacturer claims.

Studler Universal Compound Angle Plate Halves Set-Up Time

The Studler universal compound angle plate is announced by The Angle Computer Co., 5720-22 Melrose Ave., Los Angeles 38, Calif. This tool, which is said to save about 50 percent of the time formerly consumed in set-up work, can be used to lay out, machine and check work without removing the work from the plate. It can also be used as a 90 deg. angle plate on the machine or on the bench.

The plate holds work in any position from 0 to 90 deg. in two planes 90 deg. apart, and in any position within 360 deg. of the radial axis. Calibration is accomplished through the use of two 5 in. and one 10 in. protractors, each graduated in half degrees, each with a vernier graduated to 1 min. and having an accuracy within 10 sec. of the arc. Each plane has its own locking nut, by reason of which the $11\times12\times1\frac{1}{8}$ in. surface plate can be moved in any plane, leaving the other two securely locked in place. The surface plate is hand-scraped and flat to within 0.0002 in.



Studler compound angle plate

Progressive Welder Announces Two Additions to Its Storage-Battery-Powered Resistance Welder Line

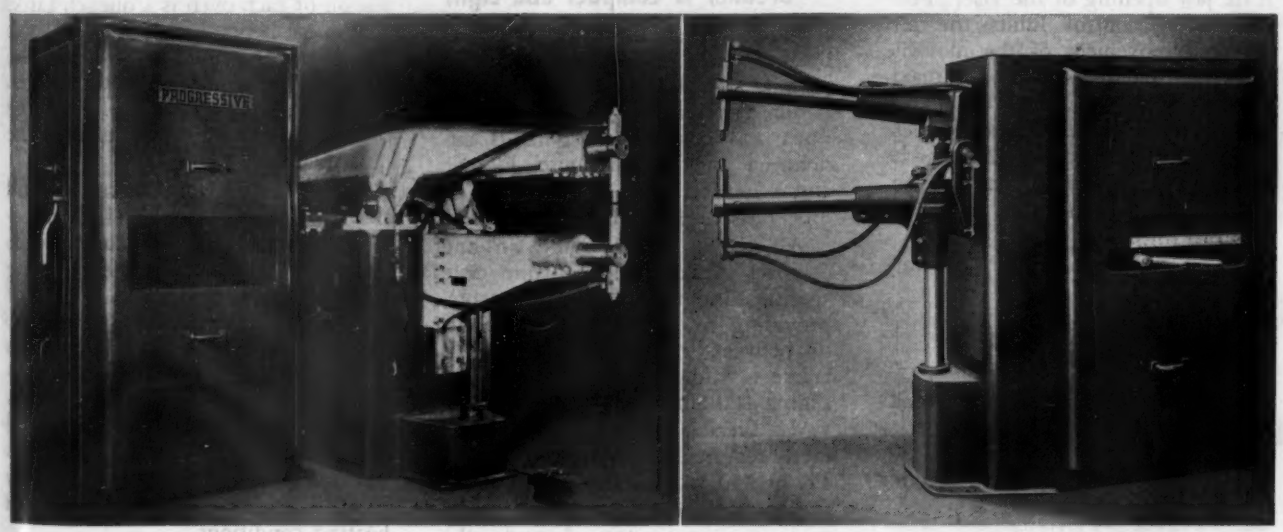
An economy spot-welder of the rocker arm type, completely self-contained, with storage batteries, contactor-controller and infinitely variable heat-control regulator enclosed, is one of two units added to the line of the Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich.

The second machine is of the heavy duty type and designed so that both spot and roll-welding can be performed on it with but minor changes. Batteries for this type of machine are housed—with contactors, battery chargers and controllers—in standardized "power-pack" units.

In addition to ability to weld conventional steels with these welders, both models are designed to handle spot welding of such materials as stainless steel and aluminum. The heavy-duty welder will spot-weld structural aluminum up to two-sections of 3/16 in. thickness.

Complete battery assemblies of both types of machines can be removed as a unit, with only simple electrical and cooling water lines to disconnect.

Low installation, operating and maintenance costs are said to be features of these machines. Total power demand is said to be only one-third that of conventional stored energy welders and one-twentieth that of a.c. welders.



Progressive storage-battery powered resistance welders: heavy-duty model, left, and economy model, right

Airco heating torch

Airco Torch is Designed for Concentrated Localized Heating

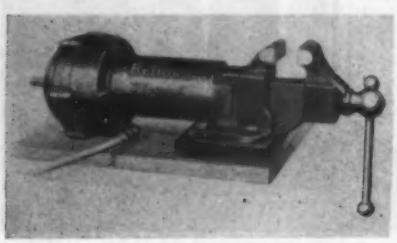
A new medium-weight heating torch, Style 9802, announced by Air Reduction Sales Co., 60 E. 42 St., New York 17, N. Y., is designed for concentrated localized heating and for silver-brazing of heavy copper plate in the manufacture of copper pipe.

Five new multi-flame acetylene heating tips as well as two multi-flame propane heating tips are available for this torch. Three mixers are available for positive pressure acetylene, low pressure acetylene and propane.

Vispeed Converts Bench Vise To Automatic Air Operation

Vispeed, a new, powerful air or hand-operated bench vise, has been developed by The Bellows Company, Akron, Ohio. It consists of a standard 4 in. Reed bench vise operated by an 8 in. foot-controlled air cylinder. Clamping pressures are adjustable from zero up to 2½ tons. The unit operates through the full range of the 6 in. jaw opening of the vise. Positive safety control limits the air-powered movement of the movable jaws, adjustable from zero to a maximum of 1 in.

Vispeed is available as a complete packaged unit, or the air unit may be purchased separately for easy attachment to any standard 4 in. or 4½ in. vise.



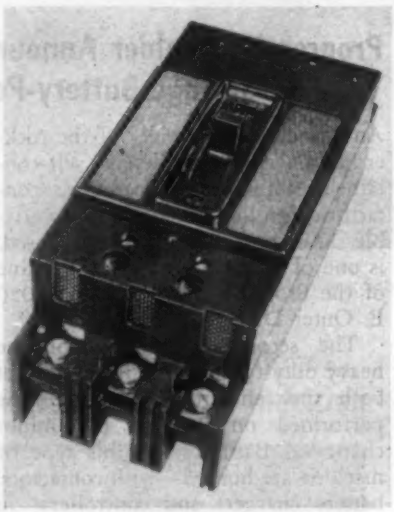
Vispeed air-operated bench vise

Self-Bonding Stonoleum Is Resilient and Tough

Stonoleum, available from Continental Asbestos Refining Corp., 1 Madison Ave., New York, N. Y., is self-bonding and can be laid over old concrete, cement, wood, or composition without adhesives or separate bonding agents. Unique collodial composition is said to give it greater resistance to direct impact and load, as well as to continuous vibration, abrasion and other traffic effects.

Stonoleum is "self-healing," in that small holes, such as those left when fixtures are removed, disappear under traffic.

Laying of Stonoleum is described as simple, requiring no skilled labor. It is ready to use 48 hrs. after laying.



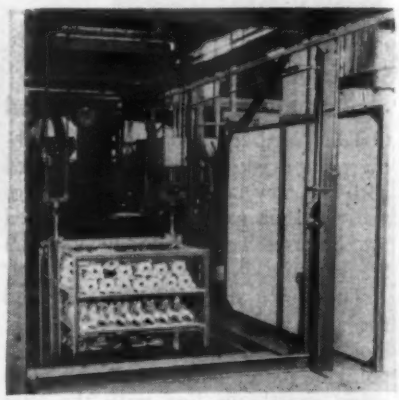
Westinghouse "De-ion" circuit breaker

Westinghouse "De-ion" Circuit Breaker is Compact and Light

A new 100 amp. "De-ion" circuit breaker which requires less space and permits lighter structures for distribution panelboards, built-in applications and bus duct plug-ins is announced by Westinghouse Electric and Manufacturing Co., P. O. Box 868, Pittsburgh 30, Pa.

All ratings are available in one compact breaker with uniform pole spacings and terminal arrangements, providing complete interchangeability between ratings. The new F frame is said to permit for the first time a 100 amp., 600 v., a.c. or 250 v. d.c. breaker in the same space formerly required by the 50 amp., 600 v. a.c. or 250 v. d.c. rating.

Equipped with thermal and instantaneous magnetic trip elements, the "De-ion" fuseless circuit breaker permits maximum loading of circuits and fast resumption of interrupted service. Contact pressure increases with wear, prolonging the life of contacts and breaker. Silver alloy contacts give increased contact life with lower wattage loss and prevent freezing. Both two and three-pole units are available.



Genrich bulk handling oven

Genrich Oven Automatically Handles Parts in Bulk

A battery of ovens for heat treating aluminum castings, designed and installed by The Genrich Oven Division of W. S. Rockwell Co., 50 Church St., New York, N. Y., gains the time and labor saving advantages of automatic handling while doing batch heating and cooling.

The installation consists of four elevator type ovens supported on heavy structural steel framework extending to the building floor, leaving ample clearance underneath each oven to permit easy loading and unloading. Directly underneath the loading station of each oven is a quench tank. The space between the oven and the quench tank is used for getting the rack or cage of work ready for raising into the oven while the cage of heated work is being cooled in the tank beneath.

The oven is electrically heated and the heat drawn from the heater sections by means of circulating fans and re-induced into the heating chamber at a recirculation rate of 58 complete air changes per minute. The cage, weighing 1000 lb., carries a work load of 800 lb. of miscellaneous aluminum castings of varying sizes so that the constant forced convection of heat at 1000 F. assures uniform exposure of all and every part of the work to the required heating conditions.

The heating cycle completed, the

Lodge & Shipley Lathes at work

. . . ACHIEVING A 250% INCREASE IN PRODUCTION OF TRANSMISSION MAINSHAFTS AT AUTOCAR

• Men responsible for greater output of Autocar's famous heavy duty trucks, are convinced of the unusual efficiency of Lodge and Shipley's full automatic lathe—the Duomatic. Here is what these production-minded men have to say about Duomatics they recently installed:

"Our transmission mainshafts are finished in four operations—two roughing and two finishing. The combined floor-to-floor time of these four operations is approximately 18 minutes. We previously used engine lathes on this part. Now, with our new Duomatics, we show a production increase of 250% over the old method."

In shops of every size and type, handling large or small lots, the Duomatic repeatedly demonstrates its amazing efficiency. Dual tool slides—front and rear—operate singly or together . . . are easily swiveled to cut from any angle. All movements and set-ups are entirely mechanical.

Have Lodge and Shipley Engineers show how the Duomatic can give you improved performance on your particular work. Write for Bulletin No. 601 showing standard cycles and other helpful data.

DO IT WITH A DUOMATIC

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

ENGINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

L & S LATHES

operator pushes a button; the oven doors, i.e., the floor of the oven, slide open, the electric hoist lowers the cage out of the oven; the plant floor slides apart and the cage is lowered into the quench tank below.

Thermo Electric furnace

Thermo Electric Furnace for Heat Treating Tools and Dies

A new electric furnace, Model OFE, providing temperatures up to 1850 F., has been announced by the Thermo Electric Manufacturing Co., 580 West Locust St., Dubuque, Iowa.

Construction features a heavy steel, welded frame, with transite sides and with 4¾ in. of insulation around the heating chamber. The heating element is said to be of highest quality nickel chromium alloy in coiled form, which completely surrounds the four sides of the muffle core.

The door is supported by two sets of parallel levers, so that when opened it moves upward and out of the way. It is heavily insulated and counter-balanced to operate easily.

Close heat selection is provided by an input controller, mounted on the instrument panel, which automatically turns the current "on" and "off" for any desired portion of a one minute cycle. The instrument panel includes an indicating pyrometer calibrated to 2000 F., a pilot light to indicate operation and an "on" and "off" switch.

This furnace measures 21 in. wide, 31 in. high and 18 in. deep. The heating chamber itself is 5½ in. wide, 4½ in. high and 10½ in. deep. It is built for operation on either 115 or 230 v. and is rated at 2000 watts.

Lawrence Engineering Offers Ten Inch Polyphase Slide Rule

Lawrence Engineering Service, 501 North Smith St., Peru, Ind., is offering a 10 in. professional slide rule with A,B,C,D, CI and K scales on front and S,L and T scales on the back of the slide. The recess at the end has a contact hairline index permitting the use of S,L and T scales without reversing the slide. The CI calibrations are in red. The Sharp hairline indicator is gunmetal framed.

Reimuller Makes 10, 20 Ton Hy-Speed Gap Style Presses

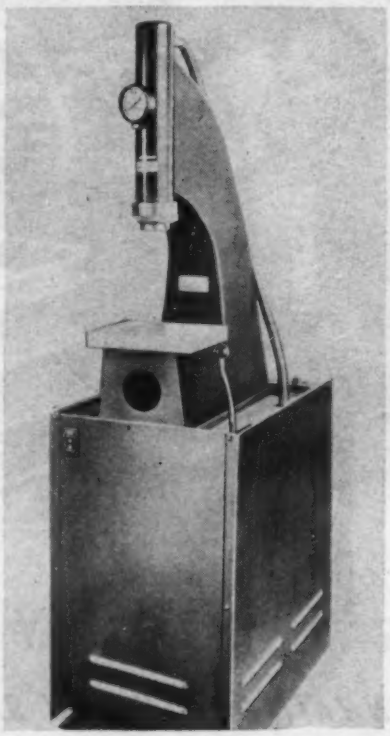
All steel construction throughout and simple hydraulic control are described as the outstanding features of the new motorized 10 and 20 ton presses manufactured by Reimuller Brothers Co., 9400 Belmont Ave., Franklin Park, Ill.

The presses are made in two models of 10 and 20 ton with 10 percent extra tonnage available. A hand lever hydraulic valve controls the ram movement through feed, hold or return position.

Other pertinent features are: hollow large area ram for holding punches and other fixtures, lapped ram, packless design, twin pressure gages showing pressure and tons. Stroke of ram is 12 in.

The motor driven hydraulic ram furnishes 1¾ gal. of oil per min to the ram, giving 1.5 in. per sec. ram speed in the 10 ton and 0.8 in. per sec. for the 20 ton.

The 10 ton press furnishes four complete strokes per min. and the 20 ton furnishes two. Each unit is equipped with 220 v., 60 cycle, 3 phase motor as standard equipment.

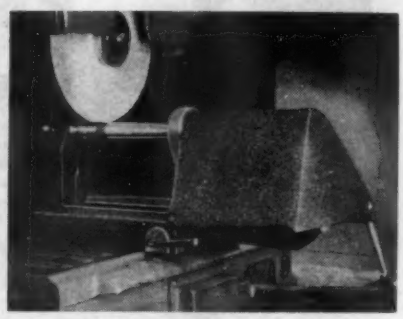


Reimuller Hy-Speed motorized press

Airco Hi-Bond Flux Promotes Successful Cast Iron Tinning

The Air Reduction Sales Co., 60 East 42 St., New York 17, N. Y., has developed a flux designed to promote uniformly successful tinning of cast iron prior to brazing.

Airco Hi-Bond does not take the place of the regular flux used for the actual brazing operation. It may be applied as a water-mixed paste or as a powder sprinkled on the surface which has already been heated to the required temperature.



Strong Multi-Purpose grinding attachment

Multi-Purpose Attachment Ups Surface Grinder Uses

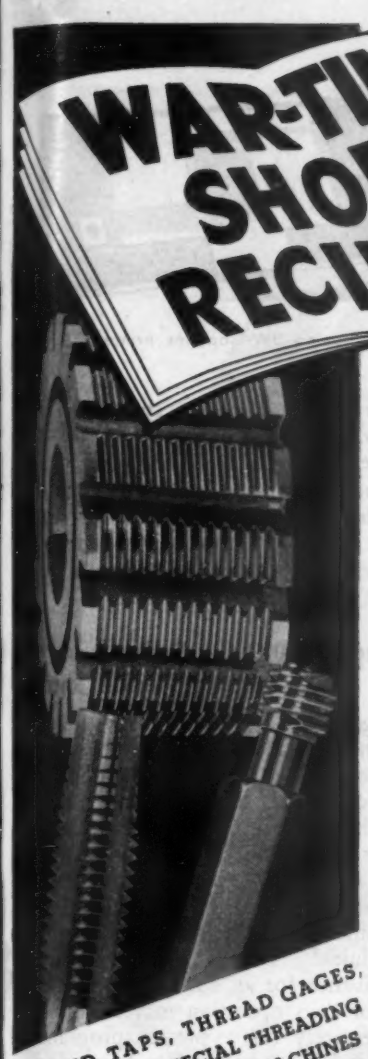
A Multi-Purpose Grinding Attachment, designed and manufactured by the Strong Manufacturing Co., 5312 Westminster Ave., Philadelphia, Pa., is said to increase the use of a surface grinder many fold. The attachment holds the piece to be ground and can be tilted to vary the angle at which it is presented; this makes it possible to cut angles in two directions without removing the piece to obtain right and left hand pitches.

The attachment is said to prove most helpful in any cylindrical grinding, either straight or at angles within its range. It is equipped with a precision indexing fixture for the purpose of grinding flats, squares or other shapes.

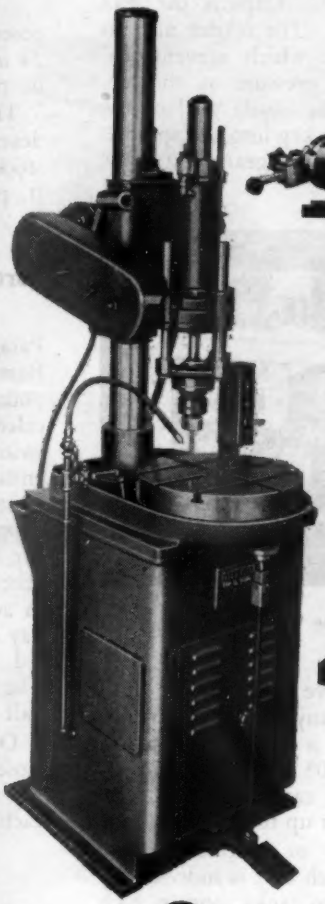
Two models are available: No. 1 with a capacity of 6 in. between centers and 6 in. dia. and No. 2 with a capacity of 10 in. between centers and 8 in. in dia.

WAR-TIME SHOP RECIPES

4 WAYS TO CUT BETTER THREADS



GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES



3

Use a "Detroit" Lead Screw Type Tapping Machine
(Light Duty Type Shown)
Ask for Bulletin LTM-44

2

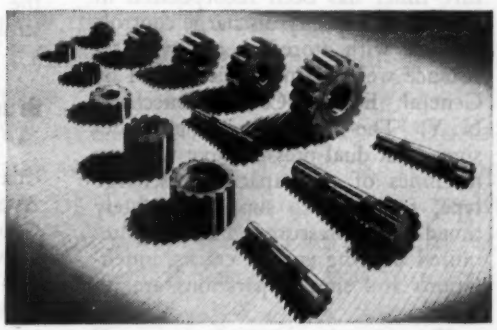
Sharpen your taps on the "Detroit" 4 in 1 Tap Reconditioner
Ask for Bulletin DTR-3

1

Check your Thread Milling Cutters on the "Detroit" Hook & Spacing Checker
Ask for Bulletin HC-43

4

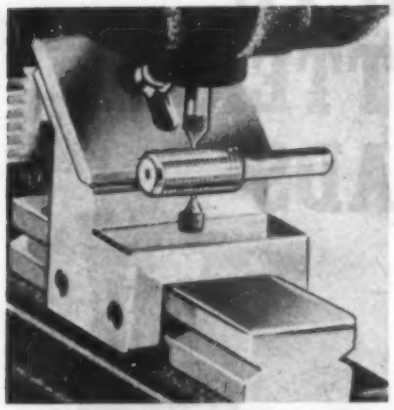
Specify Thread Milling Cutters ground from STANDARD Blanks carried in Stock
Ask for Bulletin CB-43



BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U. S. A.



Sheffield pitch diameter checking accessory

Sheffield Pitch Diameter Checking Accessory Ready

A standard ball point accessory for Sheffield Visual Gages for the rapid and accurate production checking of pitch diameter on threaded parts is announced by The Sheffield Corporation, Dayton 1, Ohio. Accuracy is said to be comparable, for practical purposes, to that of the three-wire method, but the inspection operation is many times faster. It may be used on both 500-1 and 1000-1 models.

The accessory has a capacity of 1 in. max. work dia. and is set up with threaded masters instead of gage blocks. Three pairs of ball points equivalent to the best wire sizes for 36, 20 and 12 threads per in. are furnished as standard with the accessory, and threaded parts can range from 11 to 56 threads per in. and up to 1 in. in nominal size can be checked. Pairs of ball points in other sizes are available.

G.E. Announced Electronic Forge-Pressure Timer

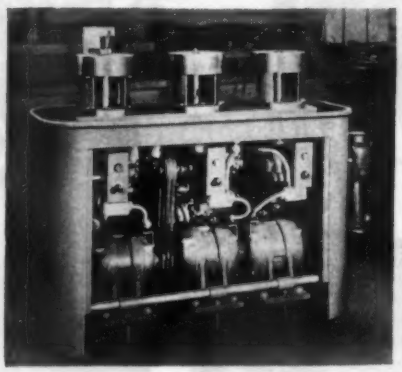
A new precise electronic forge-pressure timer has been incorporated in the line of capacity discharge controls for use with stored-energy type resistance welding machines offered by General Eectric Co., Schenectady, N. Y. The new timer, which is designed for dual pressure spot welding machines of the capacitor discharge type, functions to supply accurately timed forge-pressure, so that the required welding energy, cracks, indentations and sheet separations are reduced.

The timer is mounted on a small steel base so constructed that it can be added to any General Electric capacity discharge control already installed, providing the resistance welding machine has a dual pressure system designed for this purpose.

Prutton Tapmaster Automatically Taps Three Sizes Simultaneously

The Tapmaster, three-spindle automatic tapping machine designed and built by D. H. Prutton Machinery & Tool Co., 5295 West 130 St., Cleveland 11, Ohio, is able to tap three different size holes up to 1 in. simultaneously. Three motors with separate controls are provided.

The Tapmaster employs the lead screw principle. The master nut has a safety feature which prevents excessive vertical pressure on the tap. A keyway in the inside wall of the lead screw fits a key into the spindle. A worm-and-worm gear rotates the



Prutton Tapmaster

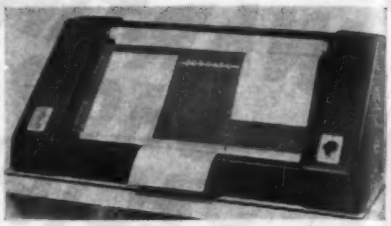
spindle. Positive feed by the lead screw prevents any tearing of threads. The total lead is held within a tolerance of 0.0005 in. A hole up to 1½ in. length can be tapped with a range in pitch up to 8.

Either single or continuous cycle can be had. Each unit is individually controlled. Two tanks, one in each leg, have 5 gal. capacity each, for coolant and hydraulic oil, in the event hydraulic holding is desired. The flow of coolant is shut off when the tap has completed the down stroke.

Bruning Announces Copyflex Printer and New Developer

Charles Bruning Co., 4700 Montrose Ave., Chicago, Ill., offers the BW-Copyflex, Model 2, continuous printer which makes possible the duplication of drawn, typed, printed or illustrated matter, as well as the making of black and white prints. Another new Bruning machine—the Model 153-M BW developer—is used for developing BW prints exposed on the Model 2.

Compactly designed, the Copyflex printer fits in desk-top space. It ex-



Bruning BW-Copyflex printer

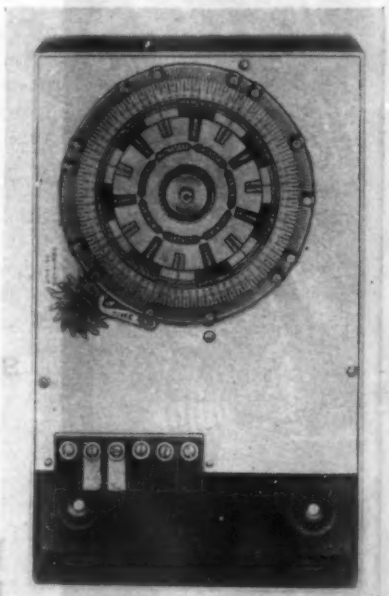
poses roll stock or cut sheets up to 24 in. wide at a speed of 5 in. to 30 in. per min.

The Model 153-M BW continuous developer develops cut sheets or roll stock up to 24 in. at a speed of 12 ft. per min.

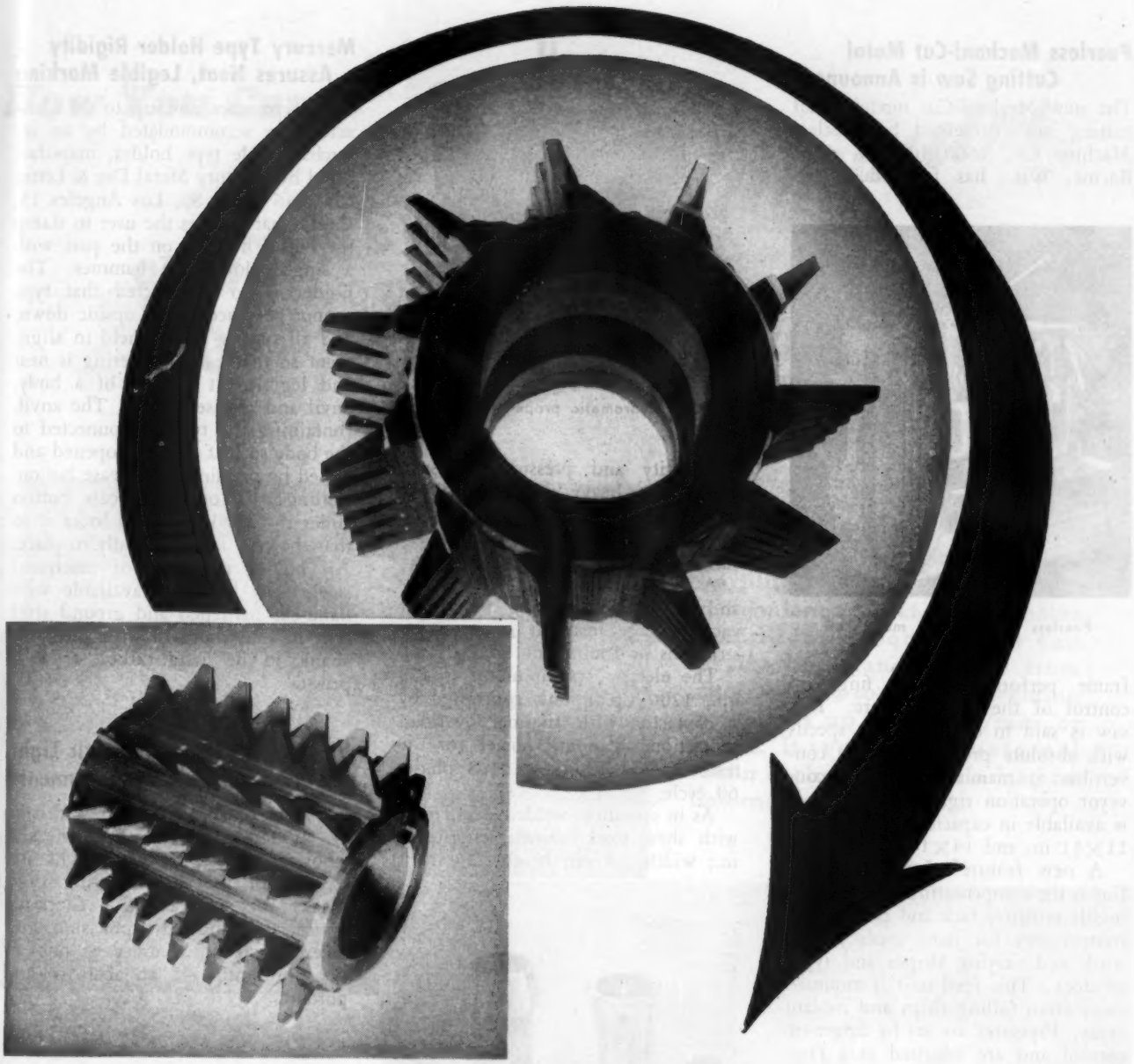
Paragon 700 Series Switch Covers Entire Week's Span

Paragon Electric Co., 39 West Van Buren St., Chicago 5, Ill., has announced its 700 series seven day calendar, dial time switch. These switches are equipped with 6 in. calendar dials which make one complete revolution every 7 days. Dial trippers can be independently set for different daily "on" and "off" schedules. Settings can be made in advance for an entire week. Any day or days operation may be omitted entirely on a pre-set program. The dial is graduated into hours and half hours.

Operational changes can be set as close as three hours apart and can be separately adjusted throughout each 24 hour day in the week.



Paragon seven-day switch



HOW *NOT* TO SHARPEN A HOB

Grinding a hob far below the root diameter of the teeth—in sharpening—as has been done in this case, weakens the hob, with resultant increased chance of breaking out the weakened teeth. That the hob stood up even under these conditions—ground down as far as this one was in service before "retiring" it—is due to the excellent control of heat-treatment and quality of material at Michigan Tool Company. Good as "Michigan" hobs are, though, it is a lot to expect from gear cutting tools.

If you are cutting gears or splines you should have a copy of "Hobbing". Write for it by number (#149-A)

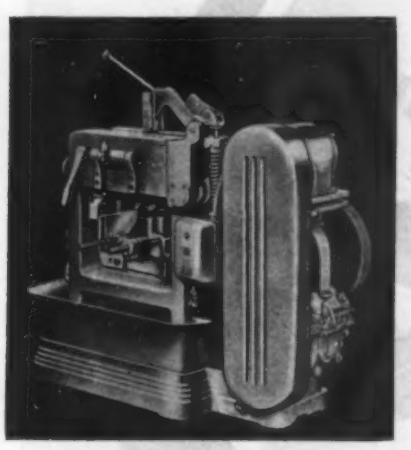
ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. MCNICHOLS ROAD . . DETROIT 12, U. S. A.

Peerless Mechani-Cut Metal Cutting Saw is Announced

The new Mechani-Cut model metal cutting saw, presented by Peerless Machine Co., 1600 Junction Ave., Racine, Wis., has four-sided saw-



Peerless Mechani-Cut metal saw

frame performance and finger-tip control of the feed pressure. This saw is said to cut at higher speeds with absolute precision and is convertible to manually operated conveyor operation right on the job. It is available in capacities of 7×7 in., 11×11 in. and 14×14 in.

A new feature of the Mechani-Cut is the compensating feed unit. A highly sensitive rack and pinion feed compensates for hard spots in the work and varying shapes and types of stock. This feed unit is mounted away from falling chips and coolant spray. Pressures are set by finger-tip control and are adjusted to a fraction of a pound.

The massive four-sided saw-frame surrounds the blade and the work and permits locating bearings above and below the saw-blade. Hardened and ground renewable inserts take all strain and wear as the saw frame reciprocates, giving sustained cutting accuracy at low cost for years of service.

AMSCO Hydromatic Propeller Test Stand is Now Available

Airplane Manufacturing & Supply Corp., Manufacturing Division, 409 North Brand Blvd., Glendale 3, Calif., has announced a Hydromatic propeller test stand, PA 809, for testing all types of Hamilton Standard Hydromatic Propellers for feathering, internal and external leakage. Provisions are made for checking distributor valves and making other tests.

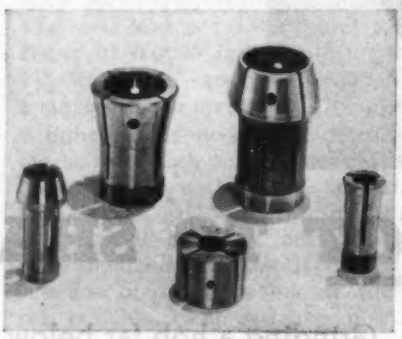
AMSCO Hydromatic propeller test stand

Capacity and pressure are supplied by a heavy duty 5 gal. per min. hydraulic pump driven by 2 hp. motor. Pressure control is assured by a heavy duty relief valve.

A filter system protects the pump and the propeller being tested. A vacuum gage instantly indicates restrictions or fouling of lines.

The electric system motor is a 2 hp., 1200 r.p.m. unit controlled by a contactor with thermal overload protection. Standard power for the test stand is 220 v., a.c., 3 phase, 60 cycle.

As to statistics: welded steel frame with sheet steel cabinet; length, 48 in.; width, 28 in.; height, 35 in.



Zagar collets and collet pads

Zagar Tool Adds Collets And Collet Pads to Line

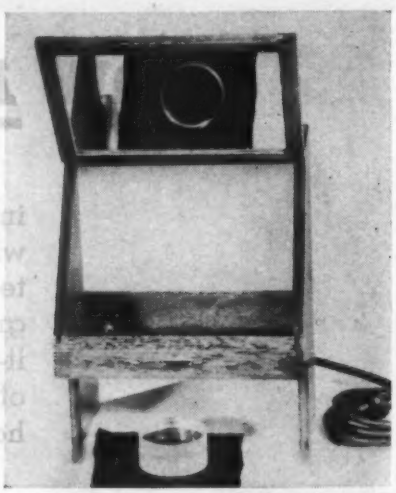
Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, has added collets and collet pads to its line of holding and indexing fixtures. Available are 5-C draw type and No. 2 W. & S. type, as well as No. 6 W. & S. type master collets. Both types of collets and pads for master collets can be furnished in rounds, hexes or squares. Zagar collets are precision made, hardened and ground throughout. The 5-C draw collets have ground threads.

Mercury Type Holder Rigidity Assures Neat, Legible Marking

Four type sizes and up to 20 characters are accommodated by an interchangeable type holder, manufactured by Mercury Metal Die & Letter Co., 546 E. 16 St., Los Angeles 15, Calif., that enables the user to stamp the entire number on the part with a single blow of a hammer. The holder is so constructed that type cannot be placed in it upside down, and all type is rigidly held in alignment so that part numbering is neat and legible. It consists of a body, anvil and release button. The anvil, containing the type, is connected to the body so that it can be opened and closed by pressing the release button. Pulling back on the release button slides the anvil back and locks it so that the type is held rigidly in place. All holder parts are of machined steel. The holder is available with hand-cut hardened and ground steel type in four standard sizes and with shank to fit hand, arbor or kick presses.

Van Keuren Monochromatic Light Tests Inspection Instruments

The Van Keuren Co., 176 Waltham St., Watertown, Mass., announces a laboratory monochromatic light intended for use in comparing gage blocks for size, and for checking optical flats and ultra precision surfaces, where an accuracy of one or two millionths of an inch is important.



Van Keuren monochromatic light

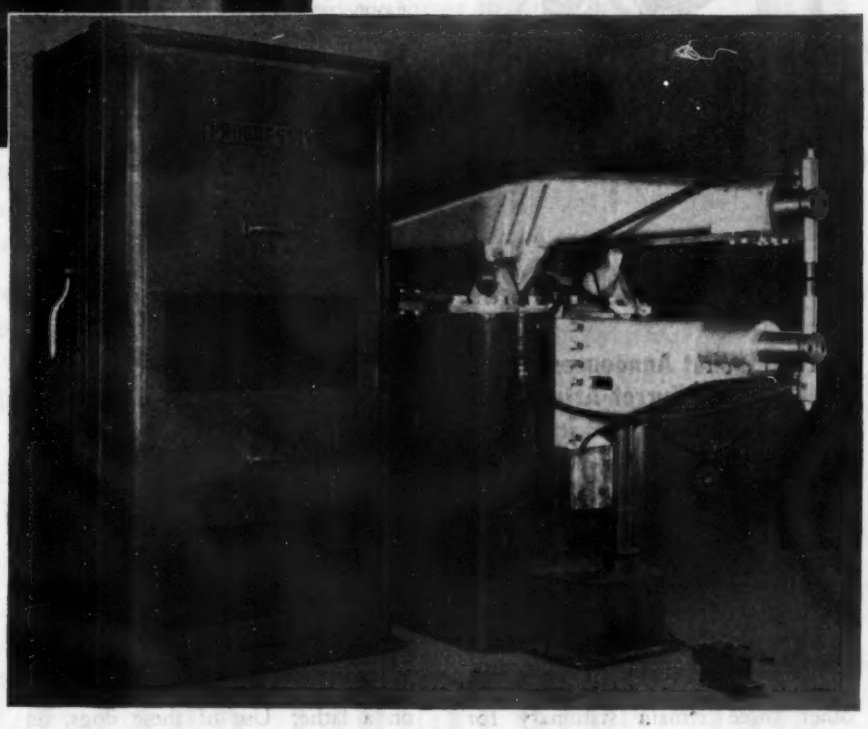
With the laboratory monochroamatic light, light wave bands are said to have their correct value of 0.0000016 in. per dark band.

Now You Can—

SPOT-WELD 3/16" ROLL-WELD 1/8" *Aluminum*

ON THE SAME SIMPLE MACHINE WITHOUT BIG POWER LINES

Progressive's new heavy duty Battery welder for aluminum can be plugged into virtually any convenience outlet. It eliminates complicated controls. It can easily be changed over from spot-welding to roll-spot-welding at speeds up to 50 in./min. or more. It requires no external water cooling, since rolls may be internally refrigerated.



Above: Heavy Duty Battery Welder set up for roll-spot-welding aluminum. The two power-packs give the machine a 50,000 amp. welding capacity.

Right: The same machine with one power-pack (25,000 amp. rating) set up for spot-welding.

Ask for "How and Why of Battery Welding", Bulletin #902.

PROGRESSIVE WELDER CO.

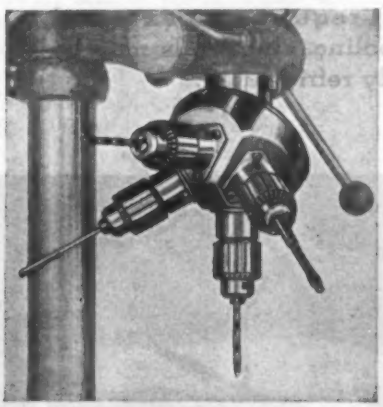
SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

Redmer master chuck adapter

Adapter Developed by Redmer Boosts No. 2 Chuck Capacity

Redmer Air Devices Corp., 601 W. Washington Blvd., Chicago 6, Ill., announces a new development in connection with its No. 2 special collet air chuck: by use of an adapter, a master collet and pads can now be used, giving a capacity up to 4 in. This change-over from the standard No. 2 special chuck requires only the removal of the stop rod and the insertion of the adapter block. The master collet screws on to this base block, holding the collet stationary.



Chicago Drillet Quadrill

Chicago Drillet Announces Quadrill Turret Attachment

Quadrill, a new drill press attachment that is said to increase capacity four times, has been announced by the Chicago Drillet Corp., 919 N. Michigan Ave., Chicago 11, Ill.

The new unit is described as a precision built rotary device that holds four tools, of which the desired one can be placed in work position by a "flick" of the finger. Only the drill in working position rotates while the other three remain stationary for safety purposes. The unit is assembled to the quill of the drill press and is driven from the spindle. Special construction is said to give strict alignment and accuracy as true as the drill press itself.

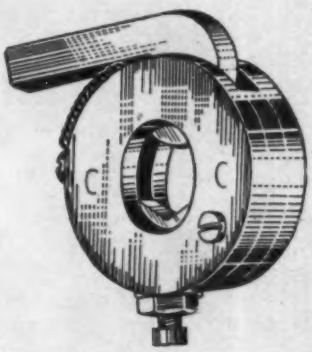
Kleer-Flo Announces Metal And Plastic Parts Cleaner

An electrically operated cleaner, available from Kleer-Flo Co., Dept. 2-G, 250 W. 57 St., New York 19, N. Y., quickly and safely removes grease and filth from 300 lb. of metals or plastics parts within 10 min.

Kleer-Flo Degreasol, the solvent recommended for use in this cleaner, is automatically filtered while the machine operates and is used repeatedly.

A fuseable link on the cover causes it to snap shut in case of fire, snuffing it out.

Kleer-Flo metal and plastic cleaner



Quik Clamp dog

Quik Clamp Dogs Designed to Speed Grinding and Turning

Quik Clamp Mfg. Co., 6313-15 Capulina Ave., Morton Grove, Ill., has announced two types of Quik Clamp Dogs, for holding work during grinding and during turning on a lathe. Use of these dogs, on any production job where parts are machined or ground between centers, is said to eliminate the lag in production time caused by loading and unloading the dog on each part. When the Quik Clamp Dog is set for a diameter, no wrench is required in dogging the work; parts can be loaded and unloaded as quickly as the operator can pick up and lay down the part. The dogs are made in a range of sizes to accomodate work diameters up to 2½ in.

Vesco Semi-Automatic Turning Attachment Cuts Output Cost

The Vesco Company, 1600 East Eight Mile Road, Detroit 3, Mich., is producing a form turning attachment capable of turning out any cylindrical part up to one-half in. diameter. It is actuated by a cam cut by hand and may be classified as a Swiss-type turning attachment.

Said to be most suitable for close tolerance screw machine work, especially on short run production, one significant advantage of this machine is its ability to make the radius of a cylindrical part blend in with the shank without leaving any marks or ridges.

The machine is semi-automatic, having all but the end-forming and cut-off tools operating automatically. Yet the cost for lathe and attachment is but approximately one-tenth of that of a fully automatic machine for the same type of work. On a short run basis, this semi-automatic machine is said to have proven capable of turning out small cylindrical parts at a third of the cost of that of the automatic.

The Vesco machine does not require the use of ground stock and operates satisfactorily on standard cold finished material, since a flexible, roller bearing-mounted collet compensates for stock variations.

Another advantage ascribed to the attachment is ability to handle an unlimited number of dimensional changes without springing, since the work is supported close to the collet at all times.

Vesco form turning attachment

Salvaging OF STEEL GAGES
By Hard Chrome Plating

★ **MULTIPLIES THE ORIGINAL LIFE OF THE GAGE AT LEAST *FIVE TIMES***

★ **PRODUCTION DEPARTMENTS GET THE BENEFIT OF *GREATER* MANUFACTURING TOLERANCES**

A wide variety of gages—including thread plug gages—are salvaged by Lincoln Park. In addition, many types of non-cutting precision tools are adaptable to Lincoln Park's chrome plate salvaging operations.

Chrome plate salvaging is—and has been for several years past—an important and highly specialized part of Lincoln Park's operations. This service offers two important advantages to any customer.

First, the average wear-resistance of a Lincoln Park chrome plated gage is approximately five times that of a similar steel gage. Second, with any gages, wear allowance must always be taken into consideration. When wear-resistant gages are used, it is obvious that allowance for wear can be reduced considerably . . . automatically increasing the manufacturing tolerance. This slight extra percentage of tolerance becomes highly important when the dimensions of parts being inspected are very close to required limits.

Today, Lincoln Park has a new, modern chrome plating department housed in a separate building adjoining the main plant. In this department are all the facilities to put new life and greater usefulness into all of your gages and non-cutting precision tools which can be salvaged by chrome plating.

***NOW* . . . YOU CAN EXPECT PROMPT DELIVERY OF SALVAGED GAGES**

Deliveries on salvaging work are considerably improved. Our weekly "Current Delivery Schedule" provides exact information. If you are not receiving this schedule regularly we will be glad to add your name to our mailing list.

ARMY E NAVY

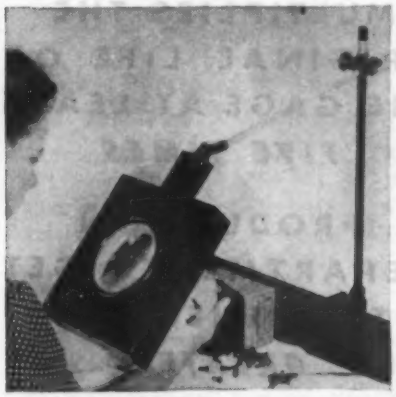
LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1721 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

Circular Fluorescent Tubing Surrounds "Inspector" Lens

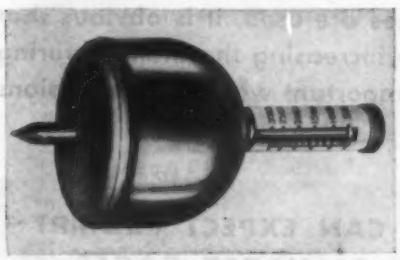
The new cold cathode fluorescent indirect lighted "Inspector" light being manufactured by Larrimore Sales Co., P.O. Box 1234, St. Louis 1, Mo., illuminates immediately like an



Larrimore "Inspector" light

incandescent bulb. The fluorescent tubing is in circular form entirely around the 5 in. magnifying lens, but shielded therefrom. It operates on 115 v., 60 cycle, a.c. The transformer is in a separate housing which can be fastened near the plug-in.

These new units are available in the clamp or screw-on type table models in maroon for shop or inspection use.



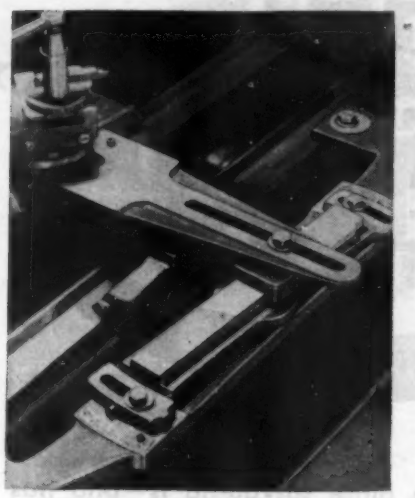
Standard tachometer

Standard Tachometer is Light Weight, Small, Easily Read

A tachometer weighing but 5½ oz. and being of but 2¼ in. dia., thereby permitting one-hand manipulation, has been introduced by Standard Machinery Co., Providence, R. I. The recording in r.p.m. is readily read and without the use of any timing or counting device. The readings are constant and record fluctuations. The scale is made up of black figures against an orange background.

The instrument's range is from 500 to 3,600 r.p.m. and checks of stock models are said to show a variation of less than 3 percent from absolute accuracy over the whole range. A pointed contact spindle is a part of the instrument for use with centered shafts and an elastic tip is furnished to slip over this point when it is used on shaft ends that are not centered.

The tachometer is dust and moisture proofed and has a baked enamel protective coating on all surfaces except the plastic enclosed scale.



Master-Taper simplified attachment

Simplified Taper Attachment Announced by Master-Taper Co.

Immediate delivery of a new taper attachment of simplified design, embodying latest improvements, is announced by Master-Taper Co., 126 North Clinton St., Chicago 6, Ill. Designated the Master Taper Attachment, it is described as making accurate taper turning, boring and threading as easy as any straight line tool operation. It may be used in any position on lathe and does not interfere with straight turning. The sliding fixture has straight gibs eliminating vibration and tool play. Graduations are in inches at one end and in degrees at the other end of the swivel bar. It tapers up to 3½ in. per ft., 16½ deg. max. in either direction, 7½ in. length at one setting. It duplicates tapered parts perfectly for accurate production.

The Master can be attached or removed in minutes. It is accurately fitted to each lathe of the listing: Logan 10 in., Atlas 10 in., South Bend 9 in., Sheldon and Clausing. Taper attachment for other lathes are manufactured to order.

Jessop Adds Improved Cutting Metal to its Tool Line

Cutting tools of a cast non-ferrous alloy made up principally of chromium, tungsten and cobalt and having hardness range from 60 to 62 Rockwell C, are being manufactured by Jessop Steel Co., Washington, Pa.

The new tool is cast-to-shape and is used in the as-cast condition, other than being surface ground. Exceptionally high red-hardness is shown by the tool, inasmuch as only one point drop in Rockwell C is noted at temperatures ranging as high as 1900 F. Peak efficiency is realized when cutting at speeds from 20 to 80 percent over the top speeds for high-speed tools. Intermittent cutting of chilled castings is possible. This alloy cannot be hot worked and is not susceptible to heat treatment.

Dust Filter Company's Four Sizes of Dust Collector

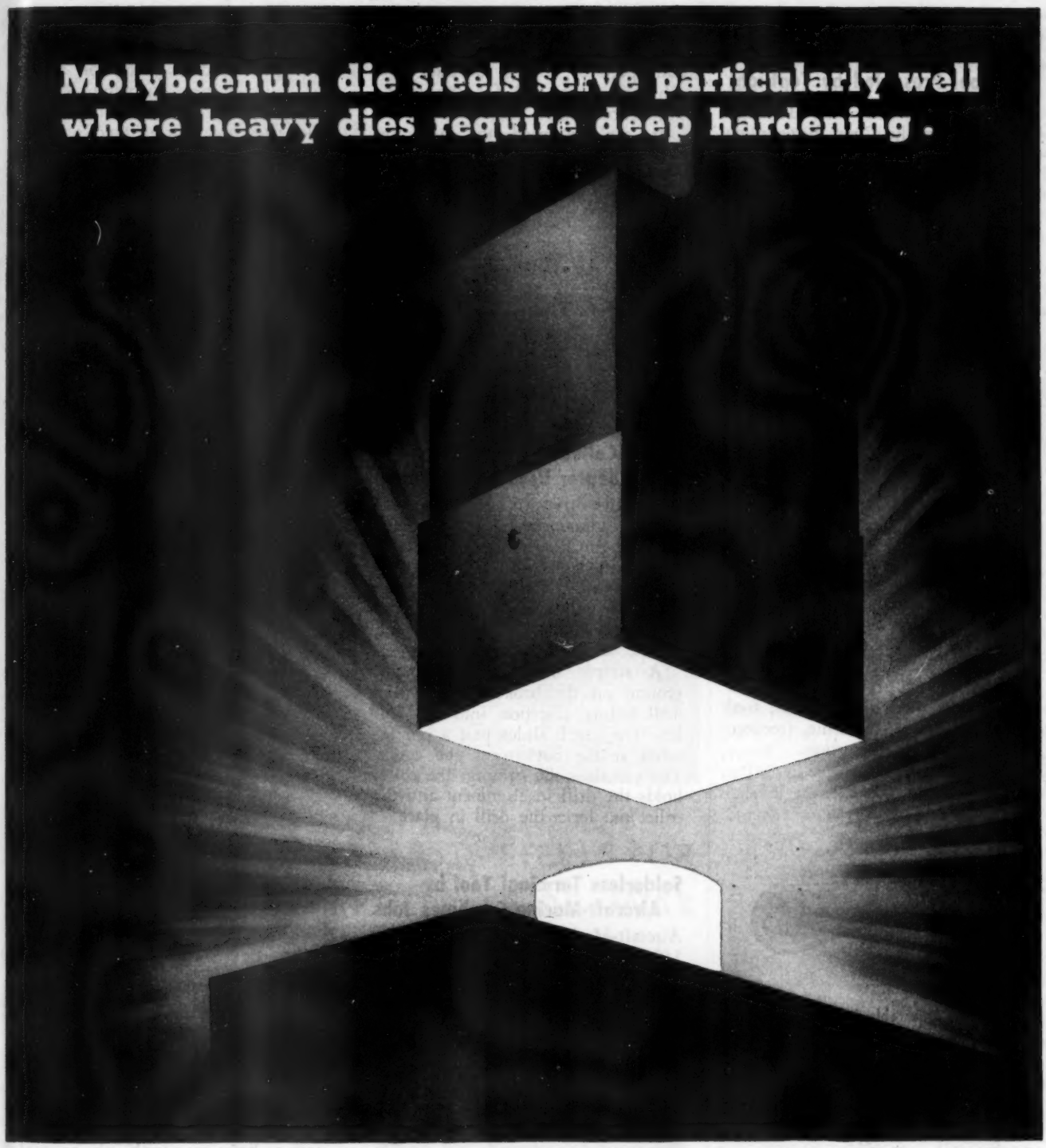
The Dustex portable dust collector, is being manufactured in four sizes by the Dust Filter Co., 4418 N. Clark St., Chicago 40, Ill.

Dust and air are separated, first by centrifugal action and second by impingement on the filter surface. The collector maintains constant static air suction of more than 4 in. at velocity over 5,000 LFM. The units are completely fireproof, weigh from 75 to 200 lb. and are 30 to 51 in. high.

Filtered air is discharged through a muffler to deaden air noise, but with minimum resistance.

Dustex dust collector

Molybdenum die steels serve particularly well where heavy dies require deep hardening.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

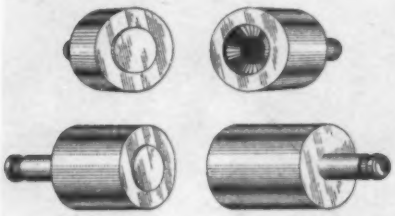
500 Fifth Avenue · New York City

MOLY

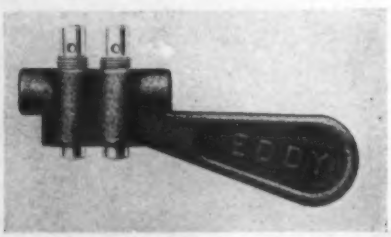
Dzus Fastener Installation Tool Presented by Topflight

The Topflight Tool Co., Towson, Md., presents the Dzus fastener installation tool, designed to simplify and shorten dimpling operations in the use of the Dzus fastener.

When placed in the squeezer the tool automatically produces a flat panel with the fastener head flush with the skin surface. Since each dimple is actually made by the surface of the fastener to be used in it there is always a perfect fit. This method requires a grommet for the installation and utilizes the angular head for the "F" type Dzus fastener to form its own dimple. The tool is said to assure absolute freedom from cracks and distortion.



Dzus fastener installation tool



Eddy adjustable inside gage

Eddy Adjustable Inside Gage Does Work of Many Others

Eddy Manufacturing Co., 321 Pine St., Pawtucket, R. I., announces production of its style 72 adjustable inside go, no go gage. It is described as replacing plug, planer, keyway and telescoping gages, as well as size blocks and spring calipers while having many advantages over them all.

Gages are available, in individual cases with 12 gaging rods of varying lengths, to gage sizes between 1 and 2 in., 2 and 4 in., and 4 and 6 in., or as a set of three in a single case.

Among the advantages ascribed to this gage are: abilty to gage the go and no go diameter in one operation; rigidity, assuring greater permanency than spring calipers; ease and speed of setting for each new job; ability to seal for the larger production jobs.

It can be used to gage the depth of keyways in holes, or to set planer and sharper tools and milling machine cutters.

Zephyr collet chuck drill adaptor

Zephyr Collet Chuck Drill Adaptor Uses Broken Flutes

A positive-drive collet chuck drill adaptor, announced by Zephyr Manufacturing Co., Inglewood, Calif., permits the use of broken flute ends of twist drills. Drills are said to be held securely and concentrically without threading or soldering and no special tools are required.

A simple flat notch is rough-ground on the broken end of the drill before insertion into the collet. The notch slides past a pin located at the bottom of the collet. The pin does the driving, the collet holds the drill in alignment and the collet nut locks the drill in place.

Solderless Terminal Tool by Aircraft-Marine Combines Jobs

Aircraft-Marine Products Inc., 1593-L North 4 St., Harrisburg, Pa., announces a new hand tool which combines all the steps involved in preparing a wire for a solderless terminal and in crimping the terminal to the wire. Included are the usual crimping notches, an efficient wire cutter and an insulation stripper with correct stripping length clearly indicated. Terminal stud hole sizes are also marked on the tool for quick checking.

AMP flag type, standard B and one-piece terminals for wire sizes 22 to 10 are crimped by the tool. Crimping notches are marked to correspond with terminals they will crimp and stripping notches are marked with Navy shipboard and commercial AWG wire sizes.

Aircraft-Marine solderless terminal tool

Gottscho Markomatic Marking Machines in Conveyor Model

The Markomatic No. 9 conveyor model marking machine, manufactured by Adolph Gottscho, Inc., 190 Duane St., New York 13, N. Y., is designed for attachment to any type of conveyor, filling machine, sealing unit, wrapping, packing or bundling machine, rolling, extruding or laminating machine. It may be used to mark automatically almost any information that may now be imprinted by hand or as a separate operation.

Gottscho Markomatic marking machine

Markomatics are capable of marking an area $2\frac{1}{2} \times 3\frac{1}{2}$ in. Imprinting medium may be rubber die or rubber, steel or brass type with ink, or steel or brass type to impress an imprint into soft material. Objects to be marked need not be stopped as long as they are traveling at a less than 10 ft. per min.

A switch, actuated by the object to be marked, causes the Markomatic to operate. More than one Markomatic may be attached to imprint the same object from different sides at the same time. Dies or type may be made easily interchangeable. Inking is automatic.

Another Markomatic, the No. 10 bench model operates automatically in response to an electric foot switch.

RESEARCH TESTS STEELS FOR PEACE IN THE CRUCIBLE OF WAR

In the train of vast tonnages and varieties of steel being produced in America for war, new and better steels for peace-time use will follow.

Because of the knowledge and experience gained through steel research and metallurgical development during the peaceful years, the steel industry was ready for war. It was prepared to produce quality steels quickly in overwhelming tonnages to help win the battle of supply and arm our forces with superior weapons and equipment.

The accelerated testing of steel in the crucible of war has enabled metallurgy and research to develop many tougher, better, more versatile steels that will open new avenues for enterprise and employment when peace comes.

JONES & LAUGHLIN STEEL CORPORATION J&L STEEL

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR

METALLURGY IN ACTION

How far will steel stretch and what "pull" can it take before it breaks in two, are facts important to quality control, quickly determinable by the tensile testing machine shown in illustration. Many other sensitive and intricate machines are employed today by the great force of trained steel research engineers and metallurgists in their work in laboratories and steel plants.

Better mortar due to metallurgist. The army had difficulties with field mortars, base couldn't stand the gaff, wore out before barrel. Young J&L metallurgist suggested trying special J&L-made armor plate for base. Ordnance worked it out. New base proved superior, even permitted greater powder charge, which lengthened mortar's range.

Miniature steel works, with small steel furnaces and rolling mills, is invaluable adjunct to department of research and metallurgy at J&L. In this pilot plant, first of its kind in steel industry, many important developments in steels were worked out before the war. Since the start of the war, a number of advancements in steel products were perfected here, put in production in J&L and other steel plants, contributed greatly to the arming and protecting of our fighting men.

Steel armor rolled on J&L strip mills, for tanks, guns, planes, after Army Ordnance proved it under fire, was developed (1942) in J&L pilot plant, from a peace-time formula of metallurgical research. The basic formula was one that J&L metallurgy had successfully worked out for oil country steel obliged to take severest punishment.

Metallography, or microscopic examination of steel, was developed by Sir Henry Clifton Sorby in 1849, is routine practice today.

Ginger snap micro-photo was submitted in jest to late Prof. Albert Sauveur (1863-1939), dean of American metallurgists, because structure of cookie resembled Sauveur's experimental photos of mild steel under microscope. Despite joshing, Sauveur persisted in development of science of metallography, now universally in use in steel research, and was awarded Bessemer medal of 1924. He held chair of metallurgy at Harvard.

De Re Metallica, first scientific treatise on mineralogy and metallurgy, 20 years in preparation, profusely illustrated with woodcuts, was written in Latin and published in early 16th century by Georgius Agricola, pen name for Georg Bauer, a Saxon. The work, translated into other languages, was text book for several centuries. Recent English translation (1912) was made by Herbert Clark Hoover and wife, the late Lou Henry Hoover.

"To arouse intelligent minds to action" was stated purpose of another pioneer scientific author, Vannoccio Biringuccio. His *Pirotechnia*, published 1540, treated of mineralogy and metallurgy and sold 30,000 copies. a medieval best seller.

Parts and Materials

Durad Fungus-Resistant Coating Seals Out Moisture

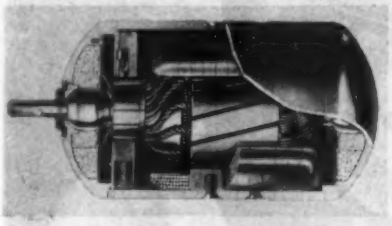
Durad Fungus Resistant Coating No. 524, designed for application to phenolic insulators, terminal blocks, junction blocks and the fixed windings of motors, generators and dynamotors of communication equipment to be used in the tropics, is announced by Maas & Waldstein Co., 438 Riverside Ave., Newark 4, N. J. This varnish passes tests for dielectric strength, hardness, flexibility and resistance to salt spray and thermal shock. It may be applied by spray, dip or brush.

Redmond type "T" Micromotor

Redmond Company Announces Two New Sizes of Micromotors

A. G. Redmond Co., Owosso, Mich., has announced two new Micromotors: type "T" is a shaded pole, totally enclosed motor for power requirements of 1/125 to 1/25 hp., incorporating a new pressure-locked, resilient rubber mounting; type "J" direct current Micromotor, designed especially for the heavier tasks in automotive heating, ventilating and air conditioning, is available in sizes from 1/20 to 1/10 hp.

Type "T" uses patented "Flush-Weld" rotor design. All rotor slots are copper filled flush with circumference with preformed copper inductors, fuse welded permanently into position for maximum electrical



Redmond type "J" Micromotor

conductivity in the circuit. Air-Stream cooling using enclosed fins and fan makes possible a small overall size motor.

Type "J" will displace up to 600 cu. ft. per min. with blowers and up to 2400 cu. ft. per min. with fan applications.

In each type, non-gumming porous bearings filter the lubricant, direct fed from extra large capacity reservoirs.

Electro Plastic Process Metal Plates on Glass or Ceramics

Perfect hermetic sealing is said to be obtained from 350 F. down to dry ice temperature by Electro Plastic Processes, 2033 W. Charleston St., Chicago 47, Ill., in plating on plastic materials, glass and ceramics. Any normal soldering method is satisfactory and no special solders are required. Either glass or ceramic cases can be plated with a metallic band for soldering to metallic end caps or insulators plated for solder sealing to metallic containers.

Fibron Tape Insulates and Protects Wires and Pipes

Fibron, a plastic insulating tape used for insulating wires, cables and electrical equipment, for splicing cables and for protecting wiring, piping and equipment exposed to caustic or corrosive fumes, oils, grease, acids, alkalies or moisture, is available from Irvington Varnish & Insulator Co., Irvington, N. J. The tape is flexible and elastic and made of a Vinylite resin. It is heat-sealing, flame resistant and high in dielectric and mechanical strength.

Sola Constant Voltage Transformer is Announced

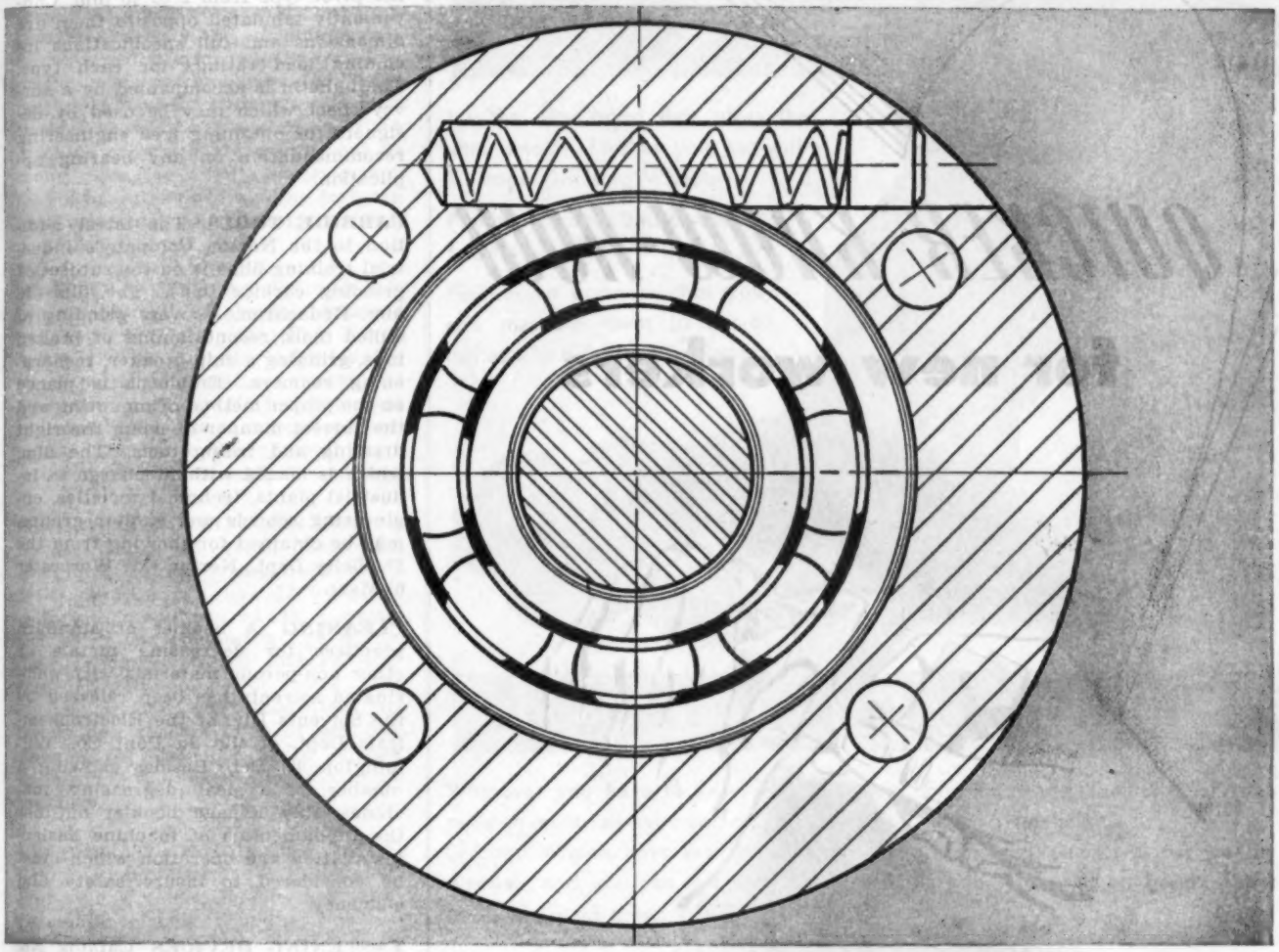
A small, compact, hermetically sealed constant voltage transformer for through-chassis mounting has been designed by Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill. It is intended for such applications as heating and refrigeration controls, television and FM receivers, vacuum tube volt-meters, electronic gaging and inspection equipment, photometric instruments and other simlar applications where precisely regulated supply voltage is mandatory.

It is said that at any reasonable transformation ratio of input to out it will provide a single output voltage constant to within ± 1 percent of rated requirements regardless of line voltage variations as great as ± 12 to 15 percent. Capacities up to 15 VA, 60 cycle operation are available and are supplied with a separate capacitor unit for external mounting. It has no moving parts, requires no manual supervision or adjustments and is self-protecting against short circuit.

Sprague Announces Ceroc Ceramic Wire Insulation

Ceroc 200, a thin ceramic coating deposited on copper, nickel and other types of wire which, when applied to copper wire maintains desirable electrical characteristics at a continuous operating temperature of 200 C., is announced by Sprague Electric Co., North Adams, Mass. It is believed to meet all requisites of a Class C insulating material as classified under A.I.E.E. standards. Thermal conductivity is high and the uniformity of the coating makes for smooth, level winding in a minimum of space. Present preferred wire sizes for applying Ceroc 200 are No. 40 to No. 21 AWG in copper wire and No. 46 to No. 28 in nickel wire. It is sufficiently flexible that round coils can generally be wound satisfactorily on existing equipment. For rectangular coils or motor armatures winding techniques may require modification.

A Bearing Tip . . .
for your design notebook



When small ball bearings, often run at higher speeds, must be mounted loose in the housing, a spiral spring contacting the outer ring as shown above, is a simple and effective means of preventing excessive slippage, housing wear and resultant formation of iron oxide. When correctly proportioned the coils of the spring are distorted and impose a certain amount of radial pressure on the outer ring. While this does not prevent axial movement of the bearing it does have the effect of stopping the ring from excessive rotation in either direction. New Departure engineers will gladly give further details. Ask for our new series of novel yet practical bearing mounting ideas for specific condition problems. 3326

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT

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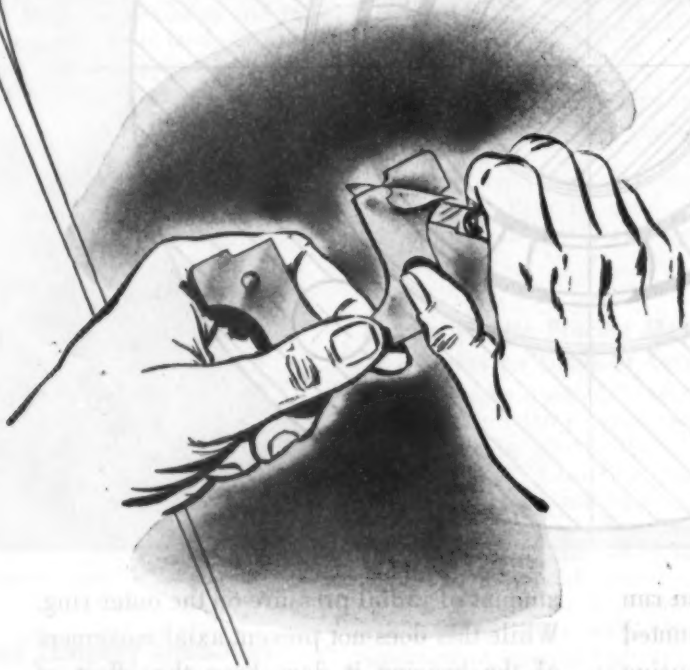
QUICKER KNOW-HOW

for new workers



THE KNOWN precision gauge of laminations in the solidly bonded Laminum shim makes machining unnecessary in fitting machine parts. But consider this too . . . it assures accuracy by preventing errors (sometimes spoilage) due to inexperience. Want performance data?

Laminum shims are cut to your specifications. For maintenance. However, shim materials are sold through industrial distributors.

Laminated Shim Company, Incorporated

50 Union Street • Glenbrook, Conn.

LAMINUM

THE SOLID SHIM THAT peels FOR ADJUSTMENT

TRADE PUBLICATIONS

BEARINGS Miniature Precision Bearings, Keene, New Hampshire, has issued Bulletin No. 44 showing a line of miniature ball bearings for instrument, industrial and special uses. Enlarged photos show closeups of the radial type from ⅛ to 5/16 in. O.D., and the pivot type from 2 to 10 mm. Conveniently tabulated opposite them are dimensions and full specifications including load ratings for each type. The bulletin is accompanied by a survey sheet which may be used by designers for obtaining free engineering recommendation on any bearing application.

CARBIDE TOOLS The latest addition to the Norton Company's industrial training films is on the subject of grinding carbide tools. The film—16 mm. Kodachrome—covers grinding of dulled tools, reconditioning of broken taps, grinding a chip breaker, resharpening reamers. Emphasis is placed on the proper method of mounting and the correct manner of using the right dressing and truing tools. The film, which is loaned without charge to industrial plants, technical societies, engineering schools and similar groups, may be obtained for showing from the Publicity Dept., Norton Co., Worcester 6, Mass.

CLEANING A booklet of standard practices for degreasing metals or other non-porous materials with chlorinated solvents has been released by the Solvents Div. of the Electrochemicals Dept. of the du Pont Co., Wilmington 98, Del. Besides showing a number of typical degreasing machines, this 10-page booklet outlines the fundamentals of machine design, installation and operation which must be considered to insure safety and efficiency.

FASTENING DEVICES Catalog No. 44, featuring a complete line of fastening devices, may be secured from the Industrial Screw and Supply Co., 711 West Lake St., Chicago 6, Ill. The catalog covers an extensive array of screws, nuts, washers, bolts, rivets, pins, terminals, hanging devices and other fastening devices. Each type is accompanied by a table giving prices, weights, packing and number per pound. Requests must be made on company letterhead over an executive's signature.

FORGINGS Publication of a bulletin, Non-Ferrous Forgings Digest, has been announced by The Brass Forging Assn., 420 Lexington Ave., New York. It will be issued periodically and persons desiring to be placed on the mailing list can do so by writing to the association.

FUSE PULLERS Bulletin No. 5-A, available from the Trico Fuse Mfg. Co., Milwaukee, Wis., illustrates and

describes a handy tool for safely removing and replacing fuses, adjusting switch and fuse clips, handling test tubes and other small tubular parts. Specifications and prices are included.

GRINDER The Sheffield Corp., Dayton 1, Ohio, has prepared a bulletin on its Micro-Form grinder designed to finish grind every desired profile within its range, directly from the drawing. The machine is said to be especially suited for the grinding of both circular and flat form tools, templets, profile gages and cams from hardened materials including tungsten carbide. Besides showing a large photo of the machine on which are pointed out its many parts, the bulletin covers principles of operation, outstanding features, uses, equipment and complete specifications.

HEAT TREATING A bulletin on flow heat treatment has been announced by The A. F. Holden Co., New Haven 8, Conn. This bulletin indicates the steps, baths, temperatures, times and equipment used for Holden flow heat treatment and also includes technical information as to the physical properties obtainable through this process.

HYDRAULIC CYLINDERS John S. Barnes Corp., 301 South Water St., Rockford, Ill., is offering Bulletin No. 401-C describing a line of hydraulic cylinders manufactured in conjunction with the company's line of hydraulic pumps, valves and self-contained hydraulic power units. The various models are illustrated and briefly described. A table of specifications gives data on bore, stroke, mounting, rod size and maximum pressure.

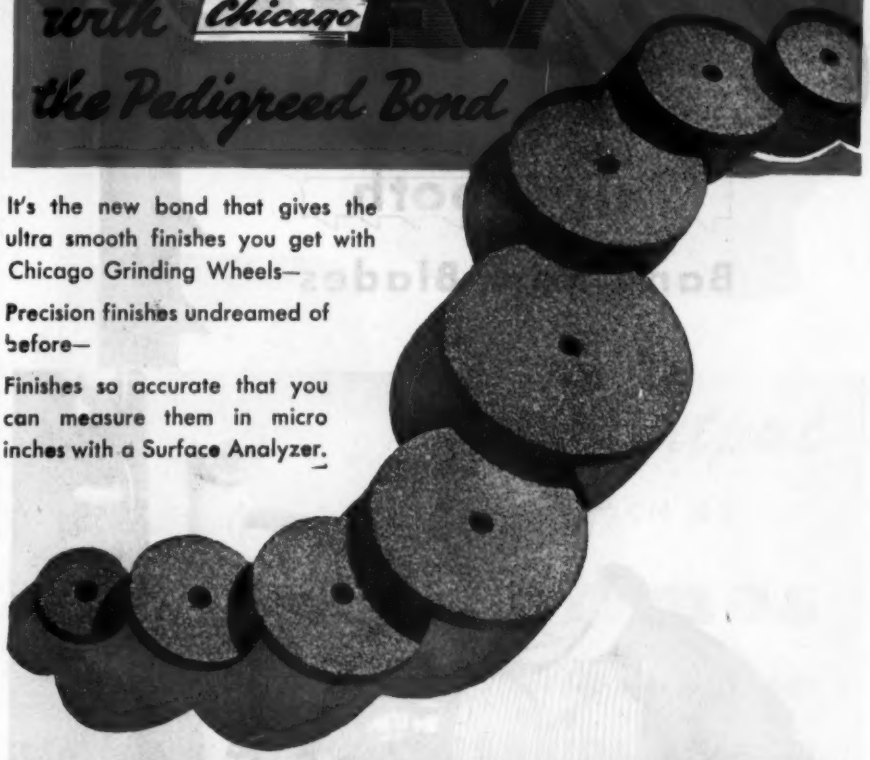
PLATING The Udylite Corp., 1651 E. Grand Blvd., Detroit 11, Mich., has prepared a folder on its new fully automatic plating machine which is shipped from maker to user completely assembled. The outstanding features of this unit are pointed out in enlarged photos and completely described in accompanying text. Diagrams show a full automatic floor plan and end- and side-views of the machine. Complete specifications are given as well as a table showing tank time for 76 and 100 racks, depending upon the particular cycle and length of tank.

PRESS TOOLS The new Type "H" hold punching units of the Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y. are featured in Catalog "H" offered by that company. These units are designed to punch holes in flanges, angles, container sides and similar shaped and formed work without making expensive, built-up, single purpose, cam action dies. Punching holes in the side of the work instead of on top of a flat surface is made possible by designing these units so the punches move back

BONDED

with Chicago FV

the Pedigreed Bond



It's the new bond that gives the ultra smooth finishes you get with Chicago Grinding Wheels—

Precision finishes undreamed of before—

Finishes so accurate that you can measure them in micro inches with a Surface Analyzer.

PERFECT FINISH INSURANCE

Whatever you have to finish—metals, alloys, plastics, wood, laminates or composition materials—you can do it better with Chicago Wheels.

Chicago Wheels have kept pace with the precision requirements of our war industries, and you can use them with confidence to finish civilian goods better in double quick time.

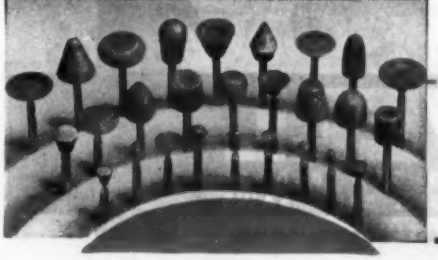
CHICAGO GRINDING WHEELS

A wide range of grains and grades and—for the duration—sizes up to 3" in diameter.

TRY ONE FREE — We'll send without charge an FV Bond Grinding Wheel or a Mounted Wheel. Tell us size you'd like.

CHICAGO MOUNTED WHEELS

The first made and the finest today. In a selection of bonds, abrasives and shapes to handle each job more efficiently.



Write for Catalog listing all Chicago products and showing comparative photographs of finishes with different kinds of Wheels.

CHICAGO WHEEL & MFG. CO.

Headquarters for Mounted Wheels and Small Grinding Wheels

1101 W. Monroe St., Dept. AT, Chicago 7, Ill.

*Half a Century of Specialization has established our Reputation as the Small Wheel People of the Abrasive Industry.

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Band Saw Blades

For HIGH SPEED CUTTING OF *Soft* NON-FERROUS METALS ALSO WOOD AND PLASTICS

1 Extra space between teeth removes material rapidly

2 Generate less heat

CAPEWELL

HACK SAW BLADES • BAND SAW BLADES
CONTOUR SAWS • SKIP TOOTH BAND SAWS

THE CAPEWELL MANUFACTURING CO., HARTFORD, 2, CONN.

and forth horizontally rather than up and down.

TAPS Bulletin G-84, available from the Landis Machine Co., Waynesboro, Pa., describes the Landis style Alt collapsible tap. The bulletin discusses collapsing action, the detachable head feature, tap chasers, interchangeability of chasers, size adjustment and general features. Included is a full page of specifications giving data on chasers, standard capacity, coarsest pitch, thread length and weight, and also another full page showing a diagram of clearances and the dimensions for the various size taps.

TORQUE TOOLS A 12-page booklet for users of torque tools has been compiled by the Apco Mossberg Co., Attleboro, Mass. The booklet gives tables, formulas and a graph as aids to determining relative shearing torques for bolts, machine screws and studs. Besides presenting technical information for plant engineers, the booklet gives elementary definitions relative to torques, and offers recommendations for checking and maintaining torque tools.

TRANSMISSION The story of man's effort to transmit power for his own benefit is told in a booklet entitled "From the Shadoof to the Dominant Drive," prepared by the Multiple V-Belt Drive Assn., 140 S. Dearborn St., Chicago 3, Ill. Starting out with the four basic tools, the lever, plane, wedge and pulley, the book traces the development of power transmission from the Roman era, through the Middle Ages, the 17th Century, the Industrial Revolution, down to the 19th and 20th Centuries and the gradual emergence of the V-Belt drive.

NEW BOOKS

MANUAL OF CONTRACT TERMINATION AND SURPLUS PROPERTY—*Published by The Research Institute of America, 292 Madison Avenue, New York 17, N. Y.* $6.

Prepared for the guidance of those responsible for contract termination and the disposal of surplus property, this manual and textbook highlights timing, interim financing and notification of suppliers and subcontractors; it also features the termination of work, disposal of machinery, equipment, inventories and work in process and adjustment in personnel.

Sections are devoted to: How to Prepare for Cancellation; Adjusting Operating Controls; Check-List of Accounting Adjustments; Filling te Gap of Wartime Termination; Getting Loans and Advance Payments; Negotiation, Key to Quick Settlement; Settlement by Formula; Making the Most of the

Uniform Clause; Computing Settlement; Determining Reimbursable Costs; Administration of Termination; Mechanics of Termination; Taking Inventory; What to do with "Leftovers"; Pricing Property for Disposal; How to Deal with Subcontractors; How to Relate Termination to Renegotiation; and, Tax Pointers on Termination.

•

MOLDING TECHNIC FOR BAKELITE AND VINYLITE PLASTICS—*224 pages. Published by Bakelite Corporation, 300 Madison Avenue, New York 17, N. Y. $1.50.*

This 224-page illustrated handbook discusses important phases of commercial molding processes and equipment. It contains comprehensive data for designer, engineer, molder and user concerning fabrication and design of hot-set and cold-set molding materials. Special chapters on cost accounting, molding plant layout, and nomenclature are of special interest. Numerous up-to-date tables, diagrams and illustrations supplement the text.

•

CONVEYORS AND RELATED EQUIPMENT—*By Wilbur G. Hudson, M. E. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $5.*

Since material handling, through the use of conveyor systems, has become a major concern of manufacturing plants of all sizes there has been a need for some compendium of information on the subject. This volume seems to fill the need adequately, to the degree it intended.

General types of conveyors are discussed and their uses outlined. Too, comparative costs are given for the various systems.

The book is intended for plant engineers, architects and consultants, rather than builders and designers of conveying equipment. Hence, the author avoids minute design detail in order that he may more completely present the functions, advantages and limitations of systems described.

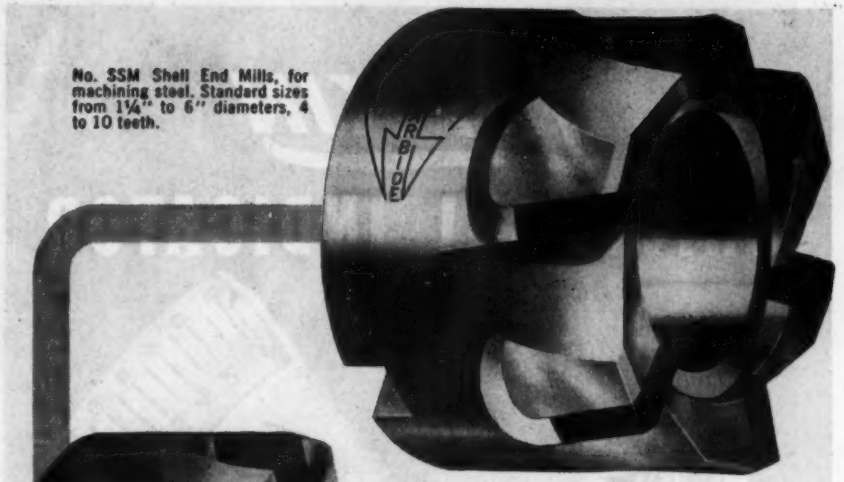
In addition to covering the systems themselves, sections of the book are devoted to driving methods and accessory equipment.

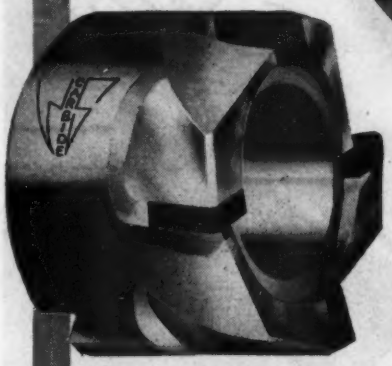
SEEN and HEARD

By JOHN R. GODFREY

Solid Carbide Milling Cutters

EFFICIENCY of machine tools depend largely on the kind of cutters provided for them. This is particularly true of modern milling practice where unbelievably high speeds are being employed. While the usual method is to braze small carbide tips to bodies of




No. SEM Shell End Mills, for machining cast iron and non-ferrous materials. Standard sizes from 1¼" to 6" diameters, 4 to 8 teeth.

Boost output

AS MUCH AS

10 times

. . . with these new

STANDARD CARBIDE TIPPED

SHELL END MILLS

UP TO 10 TIMES greater output and 4 times longer life between sharpenings, are not unusual with these new Wendt-Sonis Carbide Tipped Shell End Mills that employ a negative rake design feature. Consider these desirable advantages:

1. 20" feed compared to a 2" feed of HSS end mill
2. Increased surface feet per minute
3. 25% longer carbide tips
4. Faster, cleaner cutting . . . finer finishes

Carbide Tipped Tools are a specialty with us. We make them exclusively. Our experience, research, development and improvements are your assurance of complete satisfaction when you use W-S Carbide Tipped Tools.

Refer to "TOOLS" in your Classified Telephone Directory, for your nearest W-S Distributor, or write WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Branch Warehouse: LONG BEACH, CALIFORNIA.

NEW! CATALOG 144 just off the press. Contains data and latest prices on W-S Shell End Mills plus many standardized carbide-tipped tools formerly classed as "special." WRITE TODAY for your FREE copy.

WENDT-SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

LUFKIN

UNIVERSAL INDICATOR

EASY TO READ IN ANY POSITION. TWO READING FACES

If you are setting up or checking jobs then you'll certainly appreciate the advantages of a Lufkin Universal Indicator. Built in one unit it makes a complete revolution on its own center. Readings can be taken from either the flat or top side of the face and in any position. Especially suited for jig boring, milling machine and drill press work. Attachments are furnished for use in drill chucks, surface gages or with a Vernier Height Gage. With this indicator there's no need to use a mirror, or to get in an awkward position for use. For complete information on Lufkin Tools write for free catalog.

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LUFKIN

SAGINAW, MICHIGAN · NEW YORK CITY

TAPES · RULES · PRECISION TOOLS

cast or forged metal, some plants use tool tips as large as those of high-speed steel and clamp them into the body of the milling cutter.

Experiments are also being made with cutters made entirely of carbide, formed to the desired shape before sintering, and simply requiring grinding to make them ready for use. One cutter of this type with which experiments are being made has two helical teeth of a special contour on a body about eight inches long. This is for milling a forged aluminum blank.

Because of the shape of the cutter, brazed tips were so small that they were difficult to braze and not entirely satisfactory. Should the new cutter prove successful it may set the fashion for milling cutters when production warrants the expense.

Simpler Machine Tools

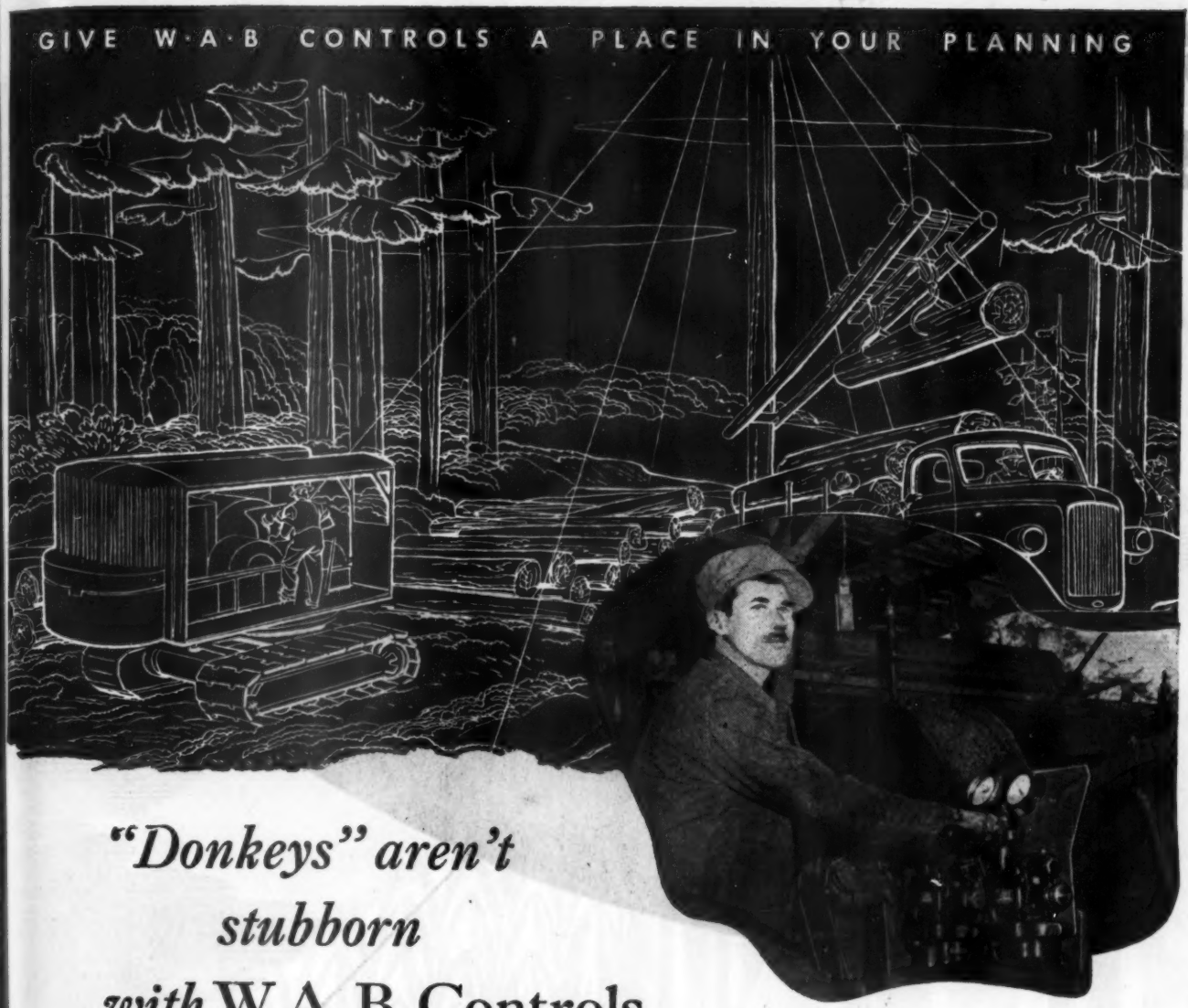
BOTH machine tool builders and users are thinking of the days when much of the equipment now being used in war production may be available for other uses. Its effect on both makers and users will depend largely on how judiciously the distribution of these machines is handled, as well as its condition when released. While some fear that these machines will do much to kill sales of new machines, others feel that this need not necessarily be the case.

If, as they argue, machine builders will greatly simplify their designs, cut out attachments or gadgets which largely provide selling talks instead of increased production, new machines can be sold at attractive prices. Production machines use only a small number of speeds and feeds on any particular job. So instead of 20 to 30 speed changes with complicated gearing and clutches, provide 6 to 8 speeds, with pick-off gears to shift these speeds into the desired range.

Glass Fused to Copper

GLASS cannot be fused directly to copper. Yet assemblies of the two materials are required in manufacture of electronic power tubes. Federal Telephone & Radio Corporation makes assemblies in this manner. First, a large copper anode, which resembles a thick-walled cartridge case, is heated to a cherry red by means of revolving gas flames while the work is spun in a lathe. A molten film of copper oxide forms on the metal. At this point a stick of glass is placed in the flame, and when hot the glass is touched to the copper. The molten copper oxide and the molten glass fuse, leaving a ring of brick-colored material on the anode. A glass tube is then heated on the end, the anode is heated, and the two parts of the power tube are joined. Thus, a copper oxide comprises the intermediate substance that enables one to join copper and glass.

GIVE W·A·B CONTROLS A PLACE IN YOUR PLANNING



"Donkeys" aren't stubborn with W.A.B. Controls

Paul Bunyan's greatest legendary exploits in juggling mammoth timber are duplicated daily by Donkey engines like this. It's a "never-sweat" job for the operator, for through the magic of air he governs the most complex operations by the movement of two small handles on the W-A-B Controls.

W-A-B devices are handling some of today's most responsible remote control jobs. An entire cycle of operations can be governed merely by positioning small handles. Operator fatigue is lessened, for there is no muscling of heavy levers, whether the operating forces are ounces or tons. Equipment damage is lessened, for interlocks prevent the setting up of opposing actions, and the sequence of operation cannot be accidentally varied.

75 Years of Pioneering

1869 1944

If your post-war products or production involves a remote control problem, you'll find W-A-B Controls a proven answer. Give them a place in your planning.

Westinghouse Air Brake Company

INDUSTRIAL DIVISION

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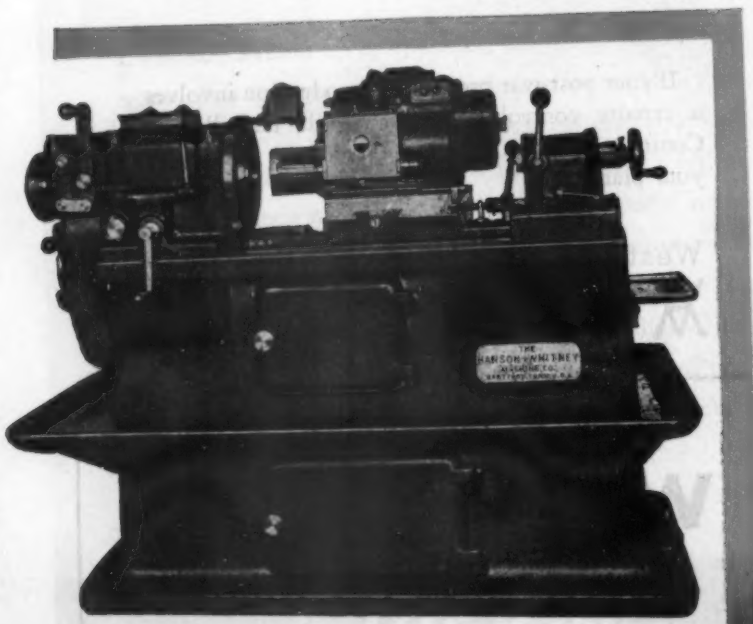
W·A·B

Pneumatic · Pneumatic Electric · Pneumatic Hydraulic

remote control systems

SAVING TIME . . .
BOOSTING PRODUCTION



The HANSON WHITNEY M

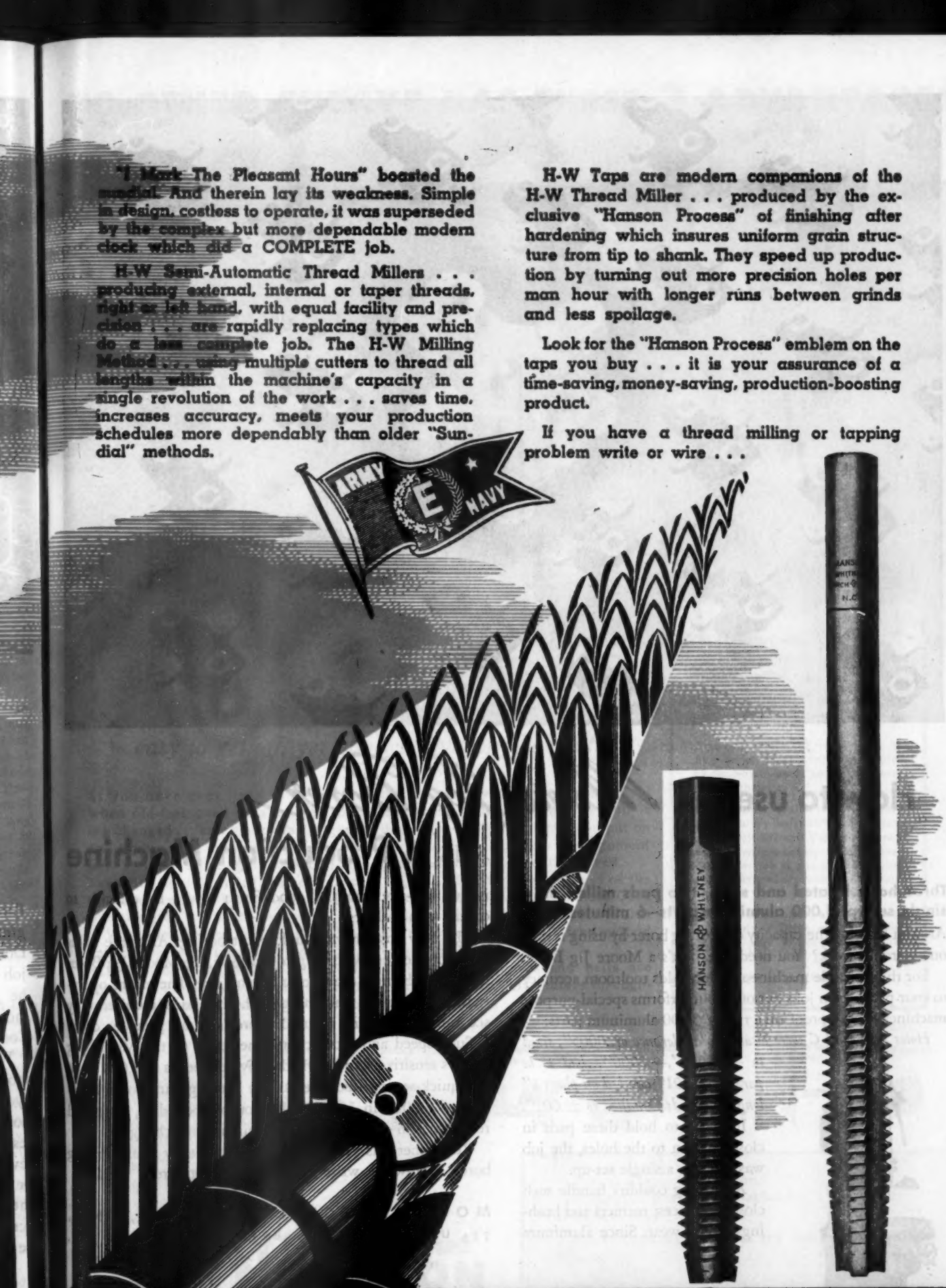
"I Mark The Pleasant Hours" boasted the sundial. And therein lay its weakness. Simple in design, costless to operate, it was superseded by the complex but more dependable modern clock which did a COMPLETE job.

H-W Semi-Automatic Thread Millers . . . producing external, internal or taper threads, right or left hand, with equal facility and precision . . . are rapidly replacing types which do a less complete job. The H-W Milling Method . . . using multiple cutters to thread all lengths within the machine's capacity in a single revolution of the work . . . saves time, increases accuracy, meets your production schedules more dependably than older "Sundial" methods.

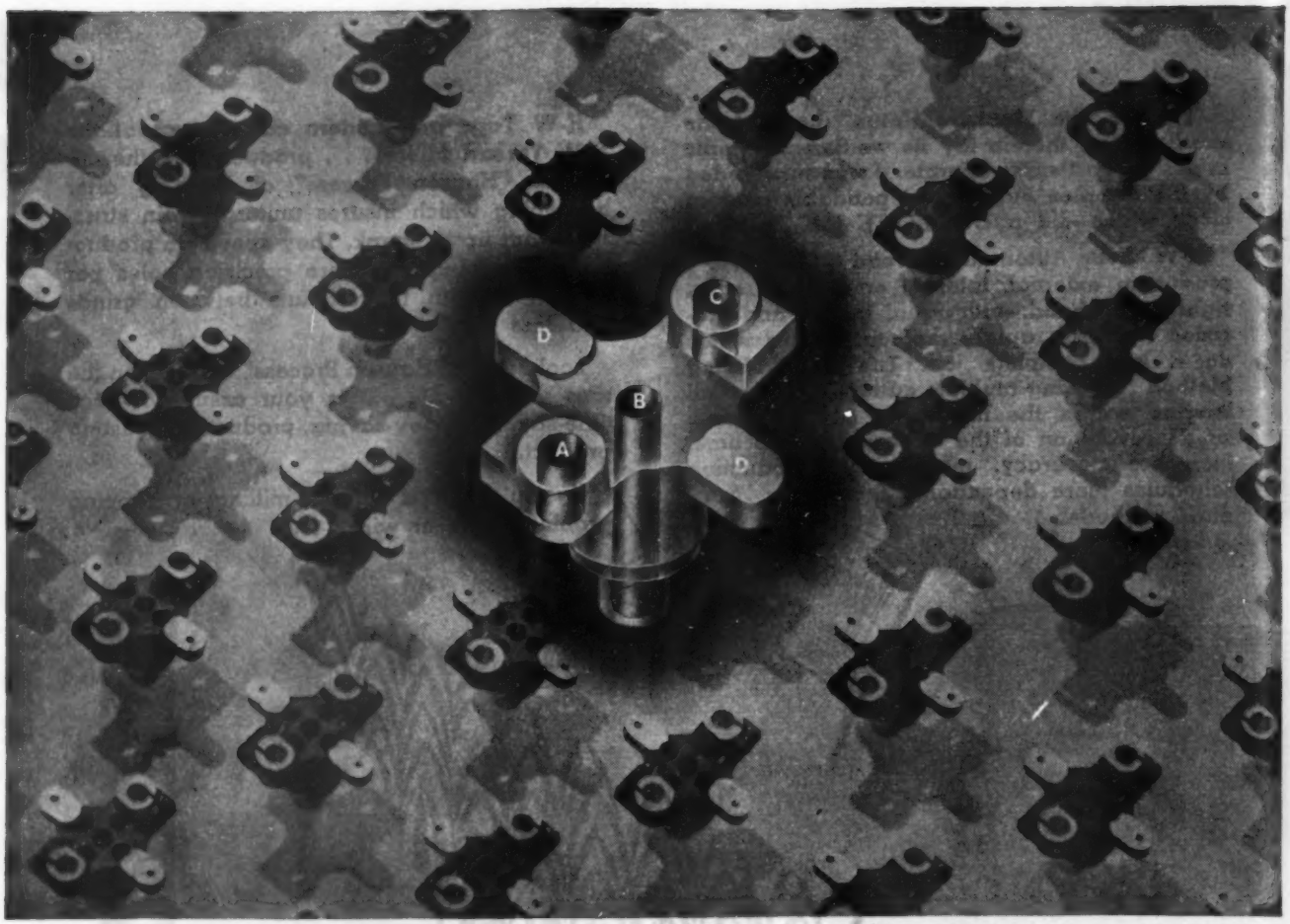
H-W Taps are modern companions of the H-W Thread Miller . . . produced by the exclusive "Hanson Process" of finishing after hardening which insures uniform grain structure from tip to shank. They speed up production by turning out more precision holes per man hour with longer runs between grinds and less spoilage.

Look for the "Hanson Process" emblem on the taps you buy . . . it is your assurance of a time-saving, money-saving, production-boosting product.

If you have a thread milling or tapping problem write or wire . . .



Y MACHINE CO. HARTFORD. CONN.

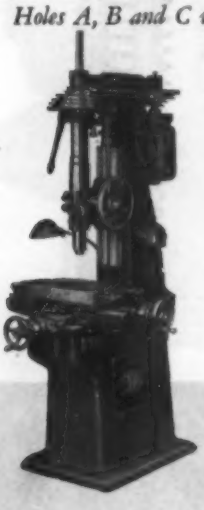


How to use the *Moore Jig Borer* as a Production Machine

Three holes located and sized, two pads milled—in a single set-up; 5,000 aluminum parts—6 minutes each. Are you limiting the capacity of your jig borer by using it only on toolroom work? You needn't...if it's a Moore Jig Borer.

For this versatile machine not only adds toolroom accuracy to your production jobs but often outperforms special-purpose machines. Here's proof on a run of 5,000 aluminum parts:

Holes A, B and C were located to a tolerance of .0005", sized to + .0005",—.0000"...had to be parallel to .001" checked on plugs 1" long...two pads D milled to ±.001".



In order to hold these pads in close relation to the holes, the job was done in a single set-up.

A drill jig couldn't handle such close tolerances; reamers and bushings would wear. Since aluminum is not free-machining, a good finish would be difficult to obtain with reamers.

The only answer was single-point boring. After the holes were roughed out with a jig costing $75, the Moore Jig Borer machined them to exact location and size. The entire operation, including the machining of the two pads, required only six minutes each and reduced appreciably all previous costs.

Such speed and accuracy are the result of the Moore Jig Borer's sensitive spindle which provides speeds to 2,600 RPM, and quick-setting lead screws. The latter, ground to an accuracy of .0002" in 16", enables you to spot, drill, bore and ream holes in one set up, with minimum tool changes.

Remember this versatility when you specify your next jig borer. Meanwhile, write for illustrated literature.

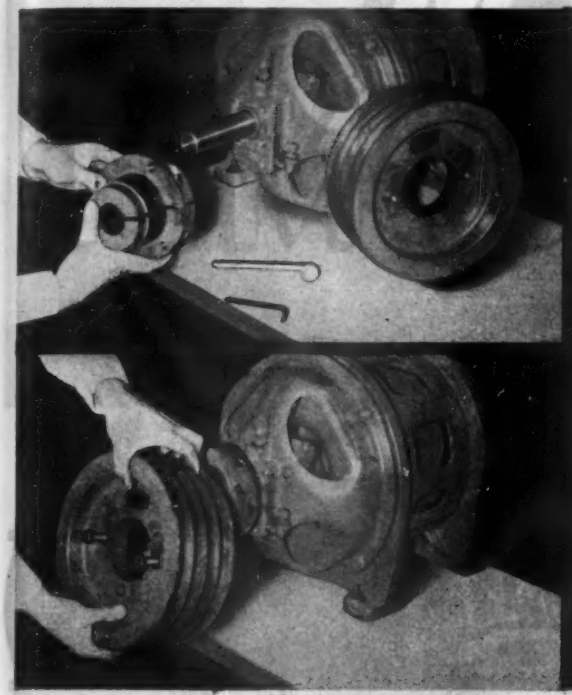
MOORE SPECIAL TOOL CO., INC.
736 UNION AVENUE, BRIDGEPORT 7, CONN.

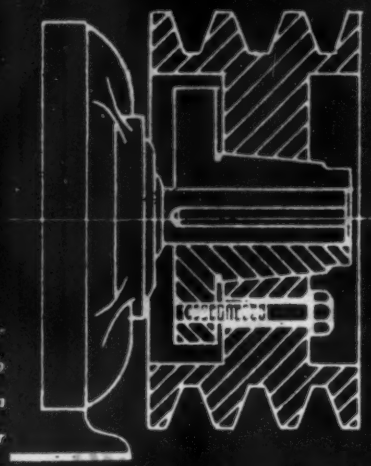
MOORE JIG BORER

MOORE TOOLS

SPOTS, DRILLS, BORES, REAMS...WITH MINIMUM TOOL CHANGES

NO OTHER SHEAVE HAS THESE 3 ADVANTAGES





Split hub makes installation easy. Hub stays put—only rim is changed. Bigger pull-up bolts—higher taper cone pressure.

Worthington's QD Sheave is easy to get on, easy to get off, yet always tight on the shaft

If you have ever been in the shop when old-fashioned sheaves were being changed . . . saw workmen sledging and prying and sweating to get one off and another on . . . got an earful of loose fits, tight fits, misalignment, then you'll appreciate these advantages of Worthington's QD sheaves.

With the QD, the hub stays put, because a variety of sizes of rims fit it. When changes are made for different speeds, the rim is easily removed and replaced. On all other sheaves, the hub has to be loosened, presenting a realignment problem when the hub is drawn up to the rim. Once you put on the hub of the QD sheave, alignment problems are permanently solved.

These advantages, plus those of the Worthington-Goodyear Endless Cord V-Belts, make the Worthington Multi-V-Drive the most trouble-free method of driving by V-belts.

Stock size sheaves and belts are available at strategic centers throughout the country.

SELECT A MULTI-V-DRIVE THE WORTHINGTON WAY
with this simplified, easy to handle Master Manual

You can select the right drive to fit your job exactly in three minutes by the watch—using just plain everyday arithmetic.

Scientifically evaluated, after years of laboratory tests, all factors affecting V-Belt life and V-Belt efficiency were taken into consideration so that each selection is guaranteed to give peak performance under all conditions for which it is recommended.

This 72 page indexed manual does your Multi-V-Drive engineering for you. Be sure to get your personal copy.

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Please send me a copy of the Worthington Master Manual.

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For Carbide Tools

Resinoid bond diamond wheels for the grinding of carbide-tipped tools in large quantities or on a production basis. Their sharp, free-cutting action provides rapid stock removal, without appreciable wear. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding.

Metal bond diamond wheels for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.

Available in all standard types and diameters, in diamond concentrations to meet your requirements.

Catalog on request.

J. K. SMIT & SONS

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CM

HOIST-POWER helps manpower to be more productive

COMET

Capacities from ¼th to 1 ton. Available for plug-in on 110, 220 or 440 volt circuits. One-hand control. Prices from $130.

Materials handling is said to represent the largest single labor cost in industry—the largest single use of manpower. CM Comet Electric Hoists can make this same man (and woman) power more productive, more efficient and with less fatigue. From "receiving", through the production line, to "shipping", CM Comets are doing an outstanding job in making both ends meet. Write today for CM Bulletin 138 for the entire illustrated details.

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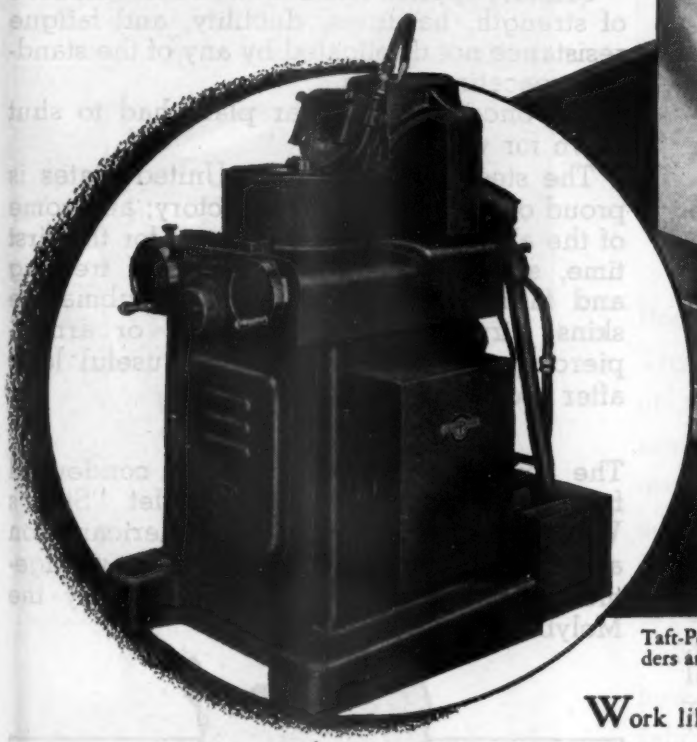
DIFFICULT SET-UPS SIMPLIFIED

by the Exclusive Tilting Wheelhead of the TAFT-PEIRCE 6" Rotary Surface Grinder

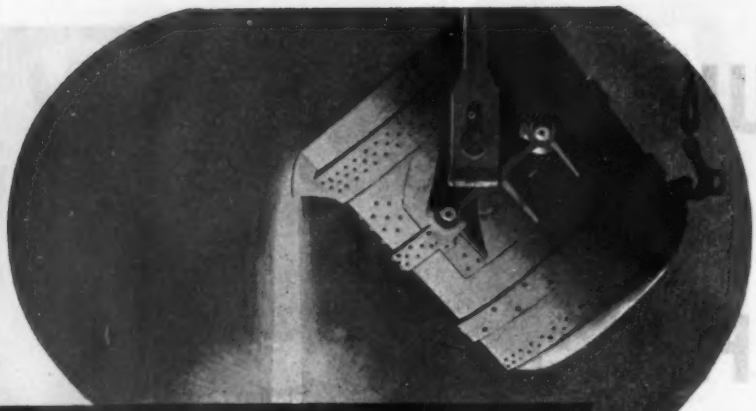


Taft-Peirce 6" Rotary Surface Grinder, set up to grind shoulders and end of camshaft for aircraft hydraulic valve.

Work like this—grinding shoulders and ends of camshafts for aircraft hydraulic valves—is accommodated easily on the Taft-Peirce 6" Rotary, without need for slow and fussy tool-setups. For one adjustment of the spindle-block enables the operator to swivel the entire spindle about the wheel center, through an arc from horizontal to 30° below center, providing ready adaptability to angle and shoulder work. Accurate grinding of gear-shaper cutters and similar tools is facilitated by the 7° angular adjustment of the chuck.

Exclusive also to the 6" Rotary Surface Grinder are the hardened and ground ways, the full ball bearing construction, and the special Taft-Peirce *Superpower* Magnetic Chuck which permits extremely small work-pieces to be held in the center of the face plate. Write on your letterhead for the illustrated bulletin describing this unique machine.

THE TAFT-PEIRCE MANUFACTURING COMPANY
Woonsocket, Rhode Island



modern steels win wars . . . build for peace!

EQUIPMENT and experience accumulated by the steel industry in peacetime proved to be tremendous assets for a nation at war. They gave us a running start.

Approximately $1,063,000,000 in Government funds were invested during wartime expansion. The industry itself spent $1,151,000,000 in expanding and modernizing—matched the Government dollar for dollar.

The iron-ore industry achieved a miracle of wartime production.

Lake ore fleets set records.

Pig iron production was pushed to the utmost.

A shortage of scrap was averted.

The industry had a brilliant corps of metallurgists who were able to solve seemingly insoluble problems. One by one each of the important alloy materials—chromium, cobalt, manganese, molybdenum, nickel, tungsten, vanadium—became hard to get in adequate quantities. Whole new families of steels were conceived around conference tables in the offices of American Iron and Steel Institute.

The new steels, known as NE (National Emergency) steels, while economical in their use of alloys, are in no sense an "ersatz" product. The first two series of such steels, announced early in 1942, were as strong as standard alloy steels having four times as large an alloy content.

Conservation was accelerated when technical committees reported on certain hardening agents which contain such elements as boron, titanium, or zirconium. These cut down the amount of alloys required.

Practically all important parts of military equipment are made of alloy steels. Modern guns, small arms, armor, projectiles, airplane engines, aircraft fuselage tubing, and even helmets are almost entirely alloy steel.

Military applications required combinations of strength, hardness, ductility, and fatigue resistance not duplicated by any of the standard peacetime steels.

Not once has any war plant had to shut down for want of steel.

The steel industry of the United States is proud of its contribution to victory; and some of the alloy steels thus produced for the first time, some of the new methods of treating and fabricating steels, to make submarine skins, airplane wing coverings, or armor-piercing shot, are likely to be useful long after the war is over.

* * * * *

The foregoing paragraphs are condensed from an admirable recent pamphlet, "Steel's War Record," issued by the American Iron and Steel Institute, to which acknowledgement and compliments are offered by the Molybdenum Corporation.

AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
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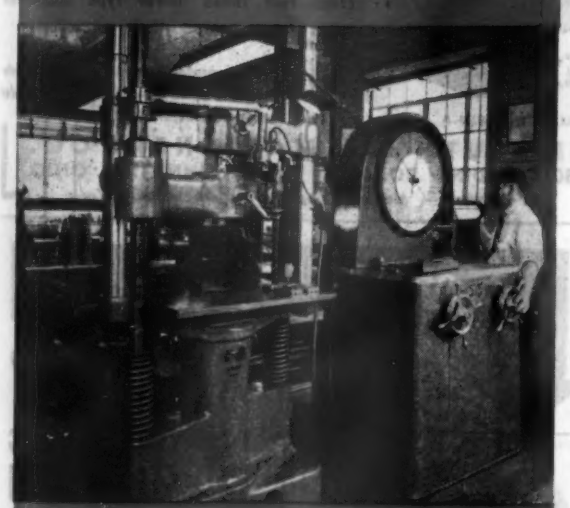
MCA

WYCKOFF COLD DRAWN CARBON & ALLOY STEELS



Controlled Quality always—

Because Wyckoff's advanced method of Heat Treating Cold Finished Bars eliminates many of the costly additional processing operations, and much of the expensive equipment involved,—many leading fabricators have adopted Wyckoff Heat Treated Bars for numerous operations where time must be saved and costs reduced.

Wyckoff metallurgists will gladly show you how sizable savings in steel fabrication costs can be effected in many of your present or post-war operations.

ARMY E NAVY

COLD FINISHED STEEL WYCKOFF

WYCKOFF STEEL COMPANY

General Offices: PITTSBURGH 30, PENNA.

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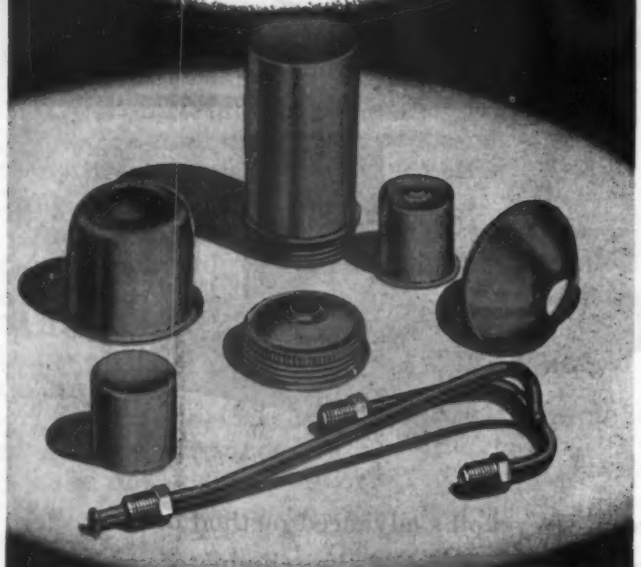
Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2". COMPLETE ANNEALING AND HEAT TREATING FACILITIES

COPPER COATED

Thomas Strip

COLD ROLLED STRIP STEEL



ECONOMY IN PRECOATED STRIP STEEL

The illustrations demonstrate successful drawing, forming, brazing, and soldering operations with copper coated Thomas cold rolled strip steel. Profitable advantages of using this material include an aid to deep drawing, die lubrication, and greater die life. As a base for further plating, for its lustrous finish, or for corrosion resistance during fabricating operations, you will find this Thomas crackproof, peelproof finish reduces over-all costs. Being precoated, Thomastrip provides a uniform coating on the inside and outside of parts, regardless of the complexity of the formation. Why not discuss your problem with Thomas engineers?

BRIGHT FINISH NOT COATED, SOLDER COATED, ELECTRO-COATED WITH NICKEL, ZINC, COPPER, BRASS, AND LACQUER COATED — IN COLORS

THE THOMAS STEEL CO. • WARREN, OHIO

SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

with an Eye to the FUTURE

Gusher Pumps Patented and Patents Pending

MODEL 11628-A

The Ruthman engineering staff are continually conucting experiments and research toward new developments and improvements in

GUSHER COOLANT PUMPS

The new models are so advantageous in operation that many plant engineers have re-designed or are re-designing their machine-tools to include them. By actual test these newer type Ruthman pumps have *proven* their superiority.

Write for new catalog, indexed for ready reference. Remember, there is a Gusher model and type for your special needs.

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The "Gusher"— Modern Pump for Modern Machine Tools

DISCS RIDE FREE IN NEUTRAL IN THE "MAXITORQ"

FLOATING DISC CLUTCH

. . . and that's only one of its many advantages to machine tool builders, to all manufacturers and users of machinery who need smooth, trouble-free clutch operation.

Maxitorq specially developed separator springs prevent contact of clutch discs in neutral . . . you can see between them. There's no abrasion, no drag, no heat and no power loss.

INSTALLATION, ASSEMBLY and **ADJUSTMENTS** are all made without the use of tools because of radically new and simplified design.

CLUTCH ENGAGEMENT is easily controlled by light pressure . . . sleeve groove wear is reduced by use of non-metallic shoes.

The **MAXITORQ** sets new standards for clutches up to 5 H.P. . . . and important developments in larger capacities, (with split-second automatic release) are soon to be completed. You will want to know about them.

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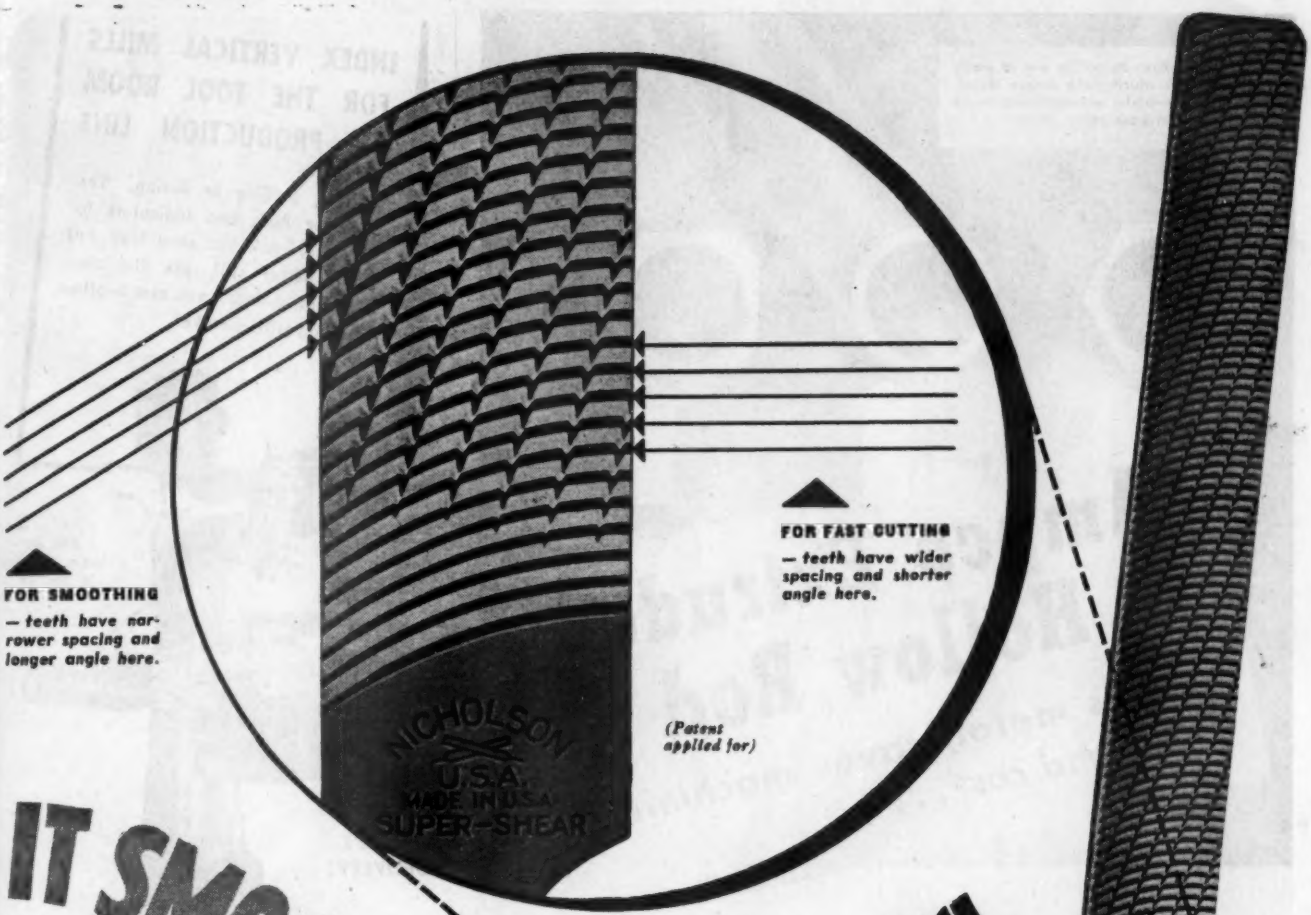
SINGLE and **DOUBLE CLUTCH TYPES** are available in both wet and dry types. Capacities from ¼ to 5 H.P. at 100 R.P.M. Also made in Pulley and Cut-Off Coupling types.

MAXITORQ floating DISC CLUTCH



IT SMOOTHS AS IT ROUGHS

ANNOUNCING THE

NICHOLSON SUPER-SHEAR FILE

. . . a distinctively new "double-purpose" milled tooth file!

Note the unique design. The curved teeth are cut in an arc that is "off center" in relation to the axis of the file. This permits them to begin with wide gullets and virtually a right angle—*for fast cutting.* They become shorter and closer together as they terminate in a long, shearing angle (approximately 37°)—*for producing the smoothing effect.*

Thus, when a surface or edge is filed with an overlapping stroke in the usual right-toward-left working direction, the Nicholson Super-Shear File "smooths out its tracks as it goes." Practically two files in one! Longitudinal serrations, at 14°, not only serve to break up the filings and assist the file to clear itself of chips, but they help to overcome "chatter" and the tendency to "run off the work."

Where can you use the Nicholson Super-Shear File? Wherever milled (curved) tooth or shear (straight) tooth files are generally used: on the flat and convex surfaces of aluminum, brass, babbitt, bronze, copper, magnesium, cast iron and soft-metal alloys; on plastics, hard rubber and hardwood.

What are the advantages of the Nicholson Super-Shear File? Fast cutting and smooth finishing in one operation. Easy control of file for accurate work. Easy clearance that saves time and keeps file efficient when working on soft metals that clog ordinary files. Long-lasting quality and unwavering uniformity.

Consult your mill-supply house, or write us direct on the uses you believe you have for this unusual file as based on the brief description given here.

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(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE

Large extrusion mill is one of many facilities which make Ampco Metal, Inc. a complete, self-contained source of copper-base alloy parts.
Ampco Extruded Hollow Rod
saves metal, saves machining time and cost . . .

All the inherent advantages of Ampco Metal — its exceptional resistance to wear, impact, fatigue, and corrosion—its specific properties as an engineered aluminum bronze alloy, held within close limits by rigid quality control — are available to you in this convenient form.

Ampco Hollow Rod actually is replacing forged material in valve seats for aircraft engines — evidence of its clean, sound structure and excellent physical properties. It is intended primarily for bushings, sleeves, lead-screw nuts, and similar machine parts. Sizes closely parallel most requirements — saving material and time.

Ampco has a specialized engineering and production "know-how" — and the complete facilities for parts production by the process that *should* be used for *your* purpose. Ampco's nation-wide organization of field engineers is ready to assist you. Call on us. Write on your business letterhead for your copies of Engineering Data Sheet 125 and the Ampco Metal Catalog.

. . . Specialists in engineering — production — finishing of copper-base alloy parts.

AMPCO Metal
The Metal without an Equal

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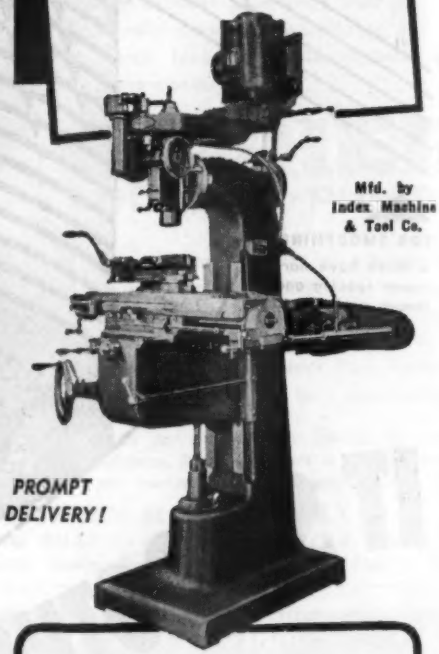
A-6B

Ampco Metal Parts fabricated from extruded stock

INDEX VERTICAL MILLS FOR THE TOOL ROOM OR PRODUCTION LINE

Milling, Drilling or Boring. Verniers or Rods and Indicators for locating. Ask the shop that has one. Better still, ask the shop that has an Index and also another of competitive make.



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

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OWI Photo by Palmer in an Allegheny Ludlum plant

AMERICAN TREASURY... THIS YEAR'S STYLE

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ALLEGHENY LUDLUM'S FILM LIBRARY

Instructional films on tool and stainless steels—some in full color, all with sound—available for free showings by companies, trade & industrial groups, student training courses, technical schools and colleges, etc., upon request.

WRITE FOR DETAILS

ADDRESS DEPT. AM-32

THOSE slabs and billets of special high-alloy steels, awaiting further processing in Allegheny Ludlum plants, are raw materials for the world's finest mechanical equipment. They're also the main reason *why* it's the finest. Special steels give the extra performance—the superior electrical properties, or strength and toughness, or resistance to heat, wear and corrosion, as the case may be—that gives one product the edge over another.

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Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

W&D . . . B-9338

QUESTION No. 1

Which INCO Nickel Alloy is FREE-MACHINING?

QUESTION No. 2

Which is free-machining and also HARDENABLE by HEAT TREATMENT?

Consult the tables below for comparative properties of these two metals

Answer No. 1 . . .

TOUGH YET EASY TO MACHINE

Engineers and screw machine products manufacturers already know this metal. Introduced several years ago, "R" Monel offers the corrosion-resistance, toughness and strength of regular Monel, plus improved machining characteristics.

Readily fabricated by cold forming, "R" Monel is available as hot-rolled and cold-drawn rounds, squares and hexagons. This INCO Nickel Alloy is well suited for automatic production of rust proof screw machine parts, yet has mechanical properties at least equal to steel screw stock (SAE 1112), and is actually *tougher.*

Answer No. 2 . . .

OFFERS EXTRA HARDNESS AND STRENGTH

This metal is the latest addition to the family of INCO Nickel Alloys. Its name . . ."KR" Monel. Like "R" Monel, "KR" Monel combines corrosion resistance and strength with improved machining.

But "KR" offers a big plus . . . *through heat treatment this unusual metal develops exceptional hardness and strength.*

A non-magnetic alloy, "KR" Monel is suitable for production of corrosion-resisting parts, and can be heat-treated after machining.

For complete information on these and other INCO *Nickel Alloys, write to:*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N. Y.

PROPERTIES OF "R" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10-mm. ball 3000 kg.
Cold-drawn, annealed	70- 85	25- 40	50-35	110-140
Cold-drawn, as-drawn	80-115	50-100	35-15	150-230
Hot-rolled, annealed	70- 85	25- 40	50-35	110-140
Hot-rolled, as rolled	75- 90	35- 60	45-25	130-170
PROPERTIES OF SAE 1112 STEEL SCREW STOCK				
Cold-drawn, as-drawn	80-100	70-80	20-10	170-202
Hot-rolled, as rolled	60- 80	35-55	40-30	126-150

PROPERTIES OF "KR" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10 mm. ball 3000 kg.
Cold-drawn, as-drawn	100-125	70-100	35-15	175-250
Cold-drawn, heat-treated	140-170	100-130	30- 5	250-320
Hot-rolled, as-rolled	90-120	40- 85	45-30	140-225
Hot-rolled, heat-treated	135-160	90-120	30-20	260-300

INCO NICKEL ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL

Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings

Worn or Broken Surfaces can be BUILT UP *quickly* with "997" Low-Fuming Rod

Let's help the other fellow, too.

Under the stress of present industrial output mechanical production equipment often feels the strain. Bronze Welding is being used extensively, not only for the repair of iron, steel and copper alloy parts, but also for the building-up of worn surfaces. If you've done an interesting bronze welding job that you feel would help the other fellow, tell us about it. If of general interest, we'll pass the word along in these pages.

With five teeth gone from this large gear and an important production unit stopped dead in its tracks, what's a Production Manager to do? A new gear meant patterns, castings, days of machining—weeks of delay. Pegging the broken teeth would cut down the delay—but increase the hazard of a repeated failure.

It's in a pinch like this that the importance of Bronze Repair Welding with the oxy-acetylene torch is most appreciated—for by using this fast, economical method of repair the gear was welded, machined and back in operation in a few days. Low temperature bronze welding with "997" Low-Fuming, Tobin Bronze* and other Anaconda Welding Rods is so controllable that it is often possible to weld parts without dismantling, and in many instances, finish by filing to a template.

"Don't Scrap It...Bronze Weld It!" is more than a slogan—it's a NECESSITY in many plants. Publication B-13 contains suggested welding procedures and examples of savings in repair time and expense. Write for a copy.

*Reg. U. S. Pat. Off.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

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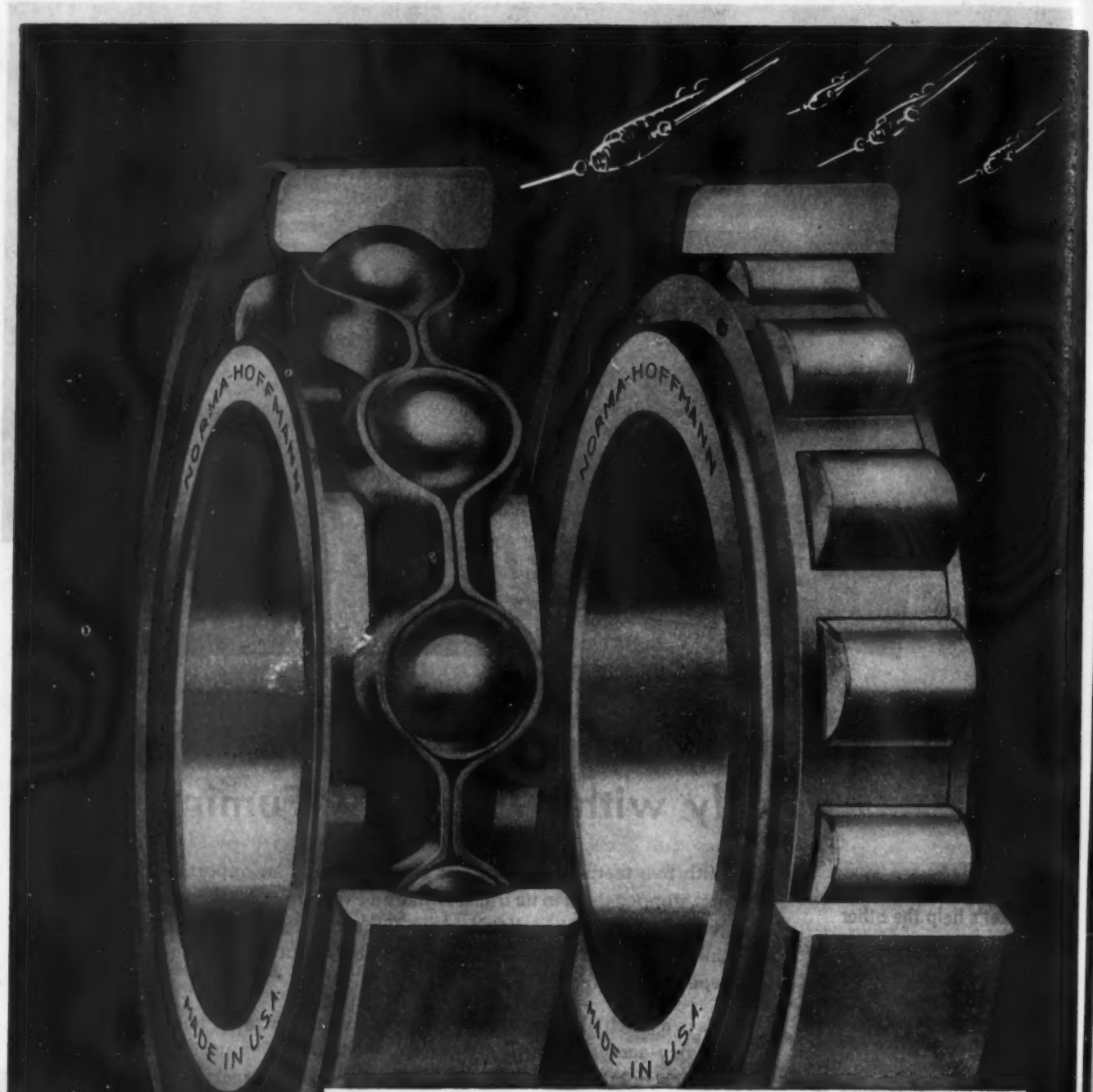
ANACONDA

Anaconda Bronze Welding Rods



PLEDGED to all-out aid to America's fighting forces, NORMA-HOFFMANN is devoting all its resources and its 34-years' experience, to the production of PRECISION BEARINGS for the Army, Navy and Air Corps, and for manufacturers of armament and equipment.

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found a better way

Follansbee's approach to the new and difficult steel-making jobs is exemplified by its development of Seamless Terne Roll Roofing. This achievement is an important reason why you can entrust your requirements for alloy and other special steels—as well as Terne roofing—to this compact, highly skilled organization.

For more than a century, Terne plate had been manufactured in small sheets which the roofer seamed together. Terne roofs dating from Colonial days are still in good condition and through the years they have required little maintenance. There would seem to be slight opportunity for improving so satisfactory a product.

But Follansbee *found that opportunity* with its process of Terne-plating lengths of steel up to 100 feet. By eliminating cross-seaming, the application of a Follansbee Terne roof is easier and faster . . . labor costs are less . . . and maintenance is reduced. In the few years since its introduction, hundreds of thousands of rolls have been installed throughout the country, to the great advantage of all concerned.

You will find advantages all along the line in dealing with Follansbee and using Follansbee products.

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POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

When DEPENDABILITY hangs by a thread

ARMY E NAVY

We are not thinking of tolerances when we thread a Buffalo bolt or nut. We are thinking that an American boy's life may depend on its accuracy and strength.

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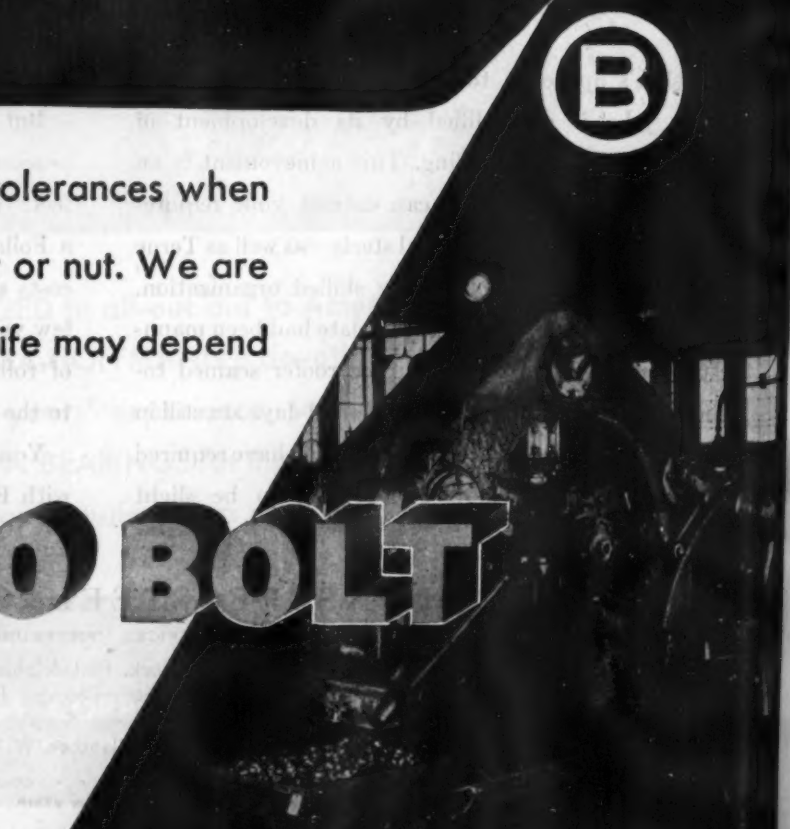

Nut maker—designed and built by the Buffalo Bolt Company

PLYTUBE OFFERS YOU . . .

High Mechanical Strength

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PLYTUBE

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and explore its unlimited possibilities in design, fabrication and application

To know about PLYTUBE* is but a first step in a search for applications where its many unique advantages can be put to practical, effective use.

PLYTUBE is Plywood tubing made by building up veneers by automatic wrapping in such a way that stress or strain in any direction acts on the total grain fibres of the total structure of the column. By varying the angle of wrap, the strength characteristics of the tube section can be determined. These angles of wrapping can be combined to produce a tube column of maximum strength.

The fact that PLYTUBE is made up of lightweight, strong material results in a tubing which, weight for weight, is capable of carrying a much heavier load than steel tubing. This outstanding feature of PLYTUBE can be taken advantage of by industry in a host of applications where it is desired to reduce weight and still maintain strength in the finished product. What many of these applications are still remain to be uncovered. Each new use suggests another. PLYTUBE's war uses have demonstrated its remarkable versatility, a fact that points to its almost unlimited future as a material of construction having characteristics of outstanding value to designers and manufacturers of products of all kinds.

Our engineers are prepared to study all possible applications and help you apply this new, lightweight tubing to meet your requirements. Use coupon below for further information.

*Manufactured under U. S. Pat. No. 2,352,533, exclusively by PLYMOLD CORP.

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When manufacturers place their bearing requirements with Johnson Bronze they gain the advantage of more than thirty-five years of exclusive bearing experience—plus complete facilities for the manufacture of every known type. When you start thinking about your postwar product, call in a Johnson Engineer. Permit him to review your applications . . . to make recommendations based on facts, free from prejudice. There is one located as near as your telephone.

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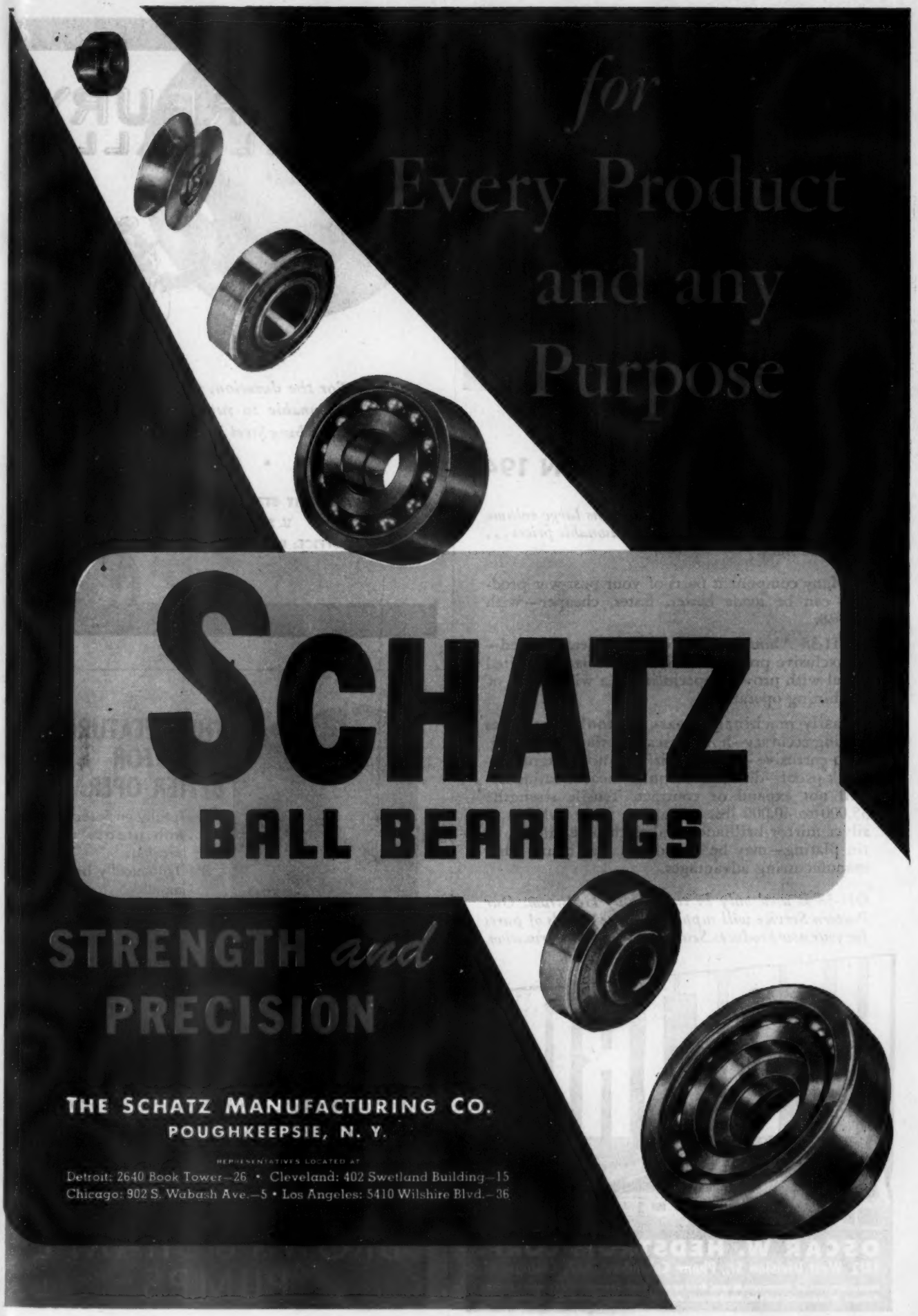
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WILL HELP YOU DO IT IN 1945

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● Many component parts of your post-war products can be made better, faster, cheaper—with OH-38.

OH-38 Aluminum Alloy—Non-Heat Treated—an exclusive product of Hedstrom—is a perfected metal with proven superiority in a wide range of machining operations.

Easily machinable—easy on tools—increases tooling accuracy—holds threads without stripping. Non-corrosive—non-oxidizing—non-magnetic—spark-proof—does not require heat treatment—will not expand or contract. Tensile strength: 35,000 to 40,000 lbs. per square inch. Polishes to silver mirror brilliancy—takes chrome, nickel, or tin plating—may be annodized. Has many other manufacturing advantages.

OH-38 is used only in castings by Hedstrom. Our Pattern Service will supply complete models of parts for your new products. Send for technical information.

HEDSTROM

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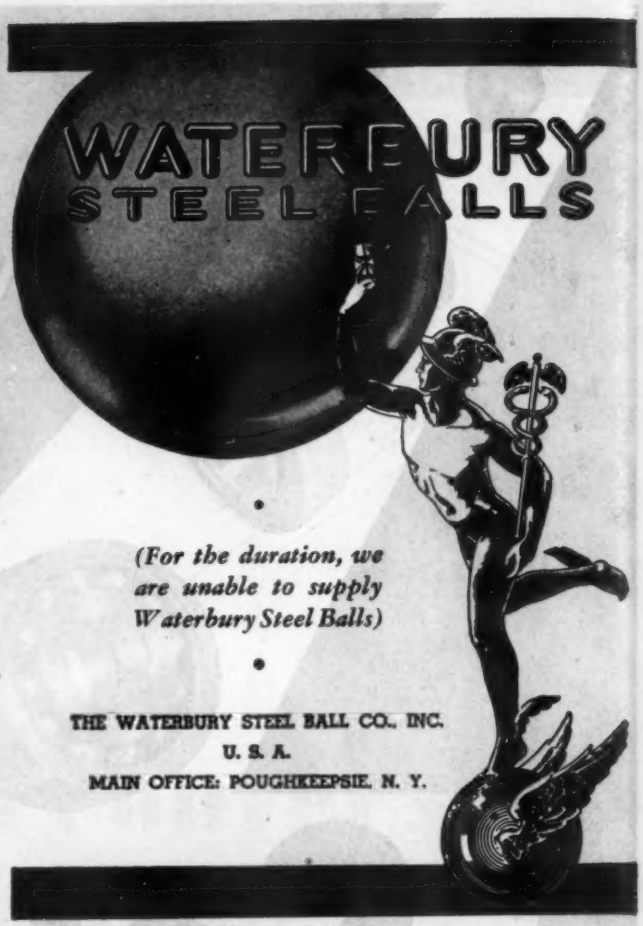
4812 West Division St., Phone Columbus 3667, Chicago, Ill.
Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications



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U. S. A.
MAIN OFFICE: POUGHKEEPSIE, N. Y.

THESE FEATURES MAKE FOR BETTER OPERATION

A—Totally enclosed motor with grease sealed bearings.
B—Dynamically balanced impeller.
C—Simple internal flow.
D—No bearings exposed to liquid.
E—Several depths of submersion.

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205, 206, 206A and 207

The features above and others give Brown & Sharpe Motor Driven Centrifugals definite operating advantages. Catalog on request. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

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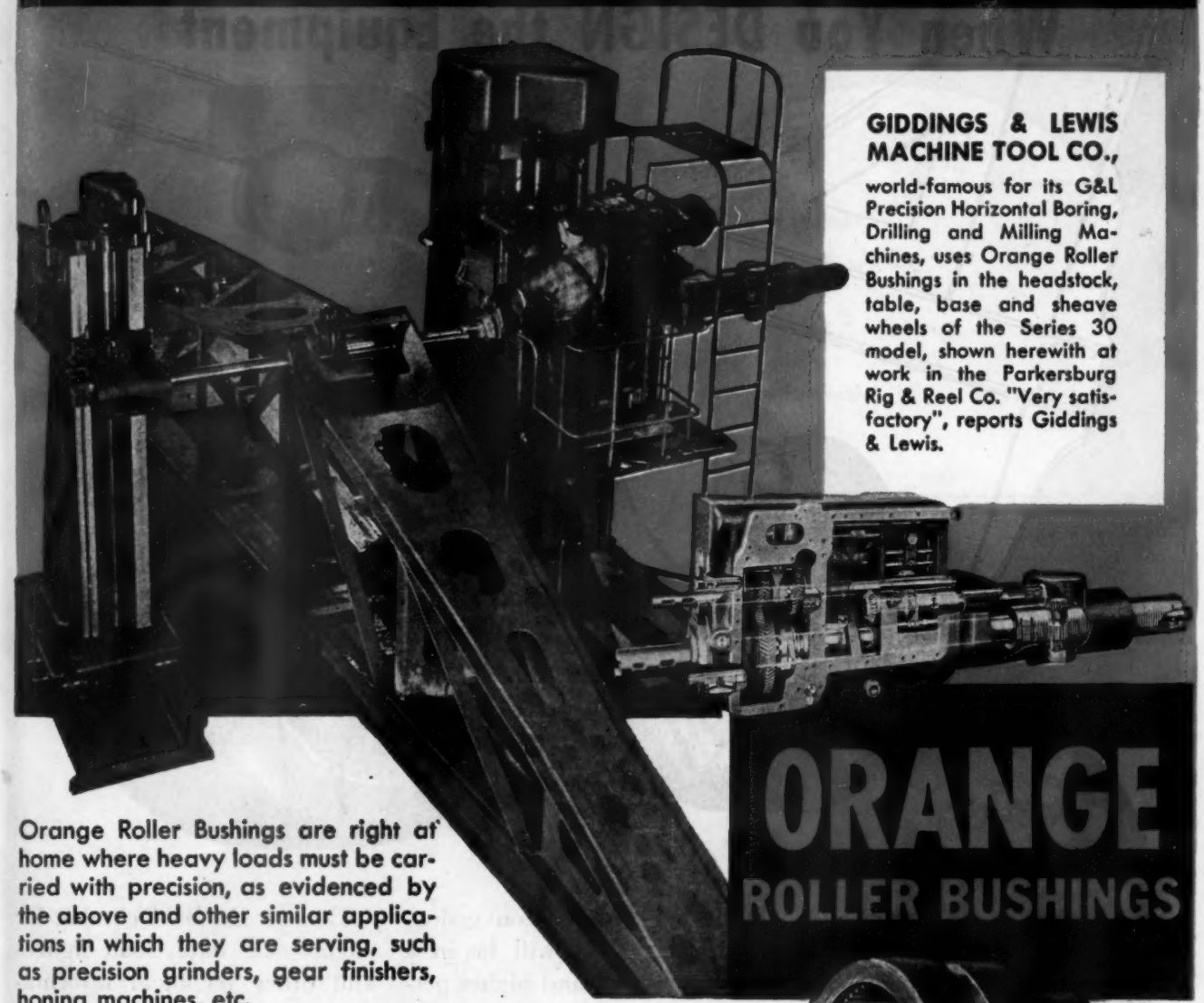

GIDDINGS & LEWIS MACHINE TOOL CO.,

world-famous for its G&L Precision Horizontal Boring, Drilling and Milling Machines, uses Orange Roller Bushings in the headstock, table, base and sheave wheels of the Series 30 model, shown herewith at work in the Parkersburg Rig & Reel Co. "Very satisfactory", reports Giddings & Lewis.

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Orange Roller Bushings are right at home where heavy loads must be carried with precision, as evidenced by the above and other similar applications in which they are serving, such as precision grinders, gear finishers, honing machines, etc.

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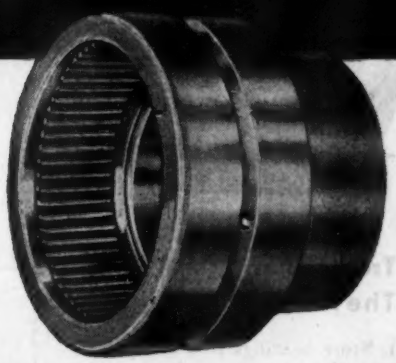

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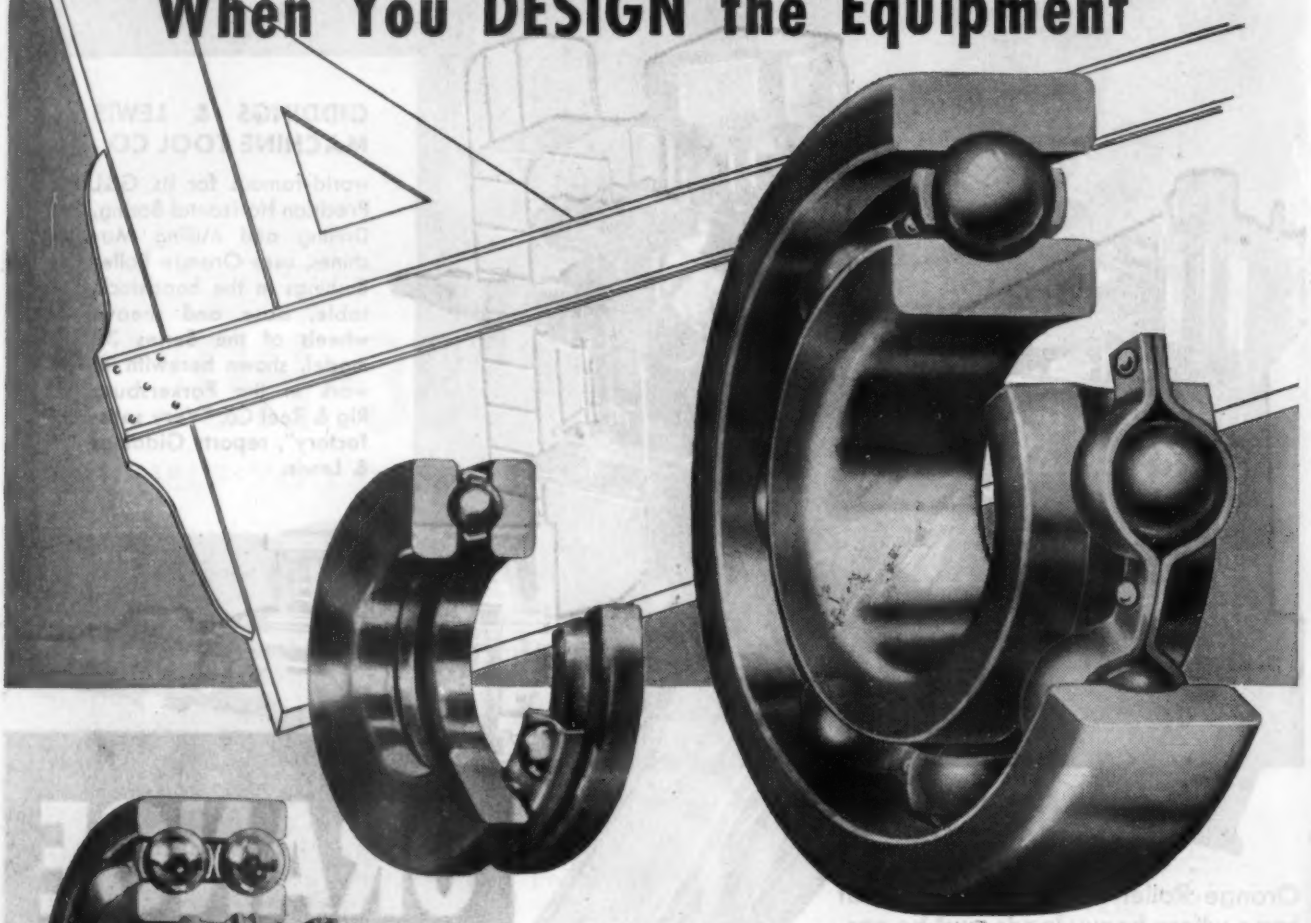

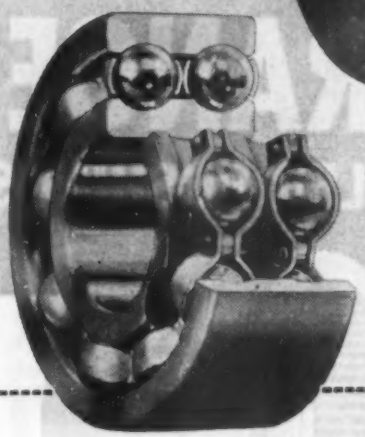

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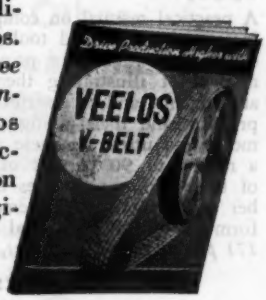

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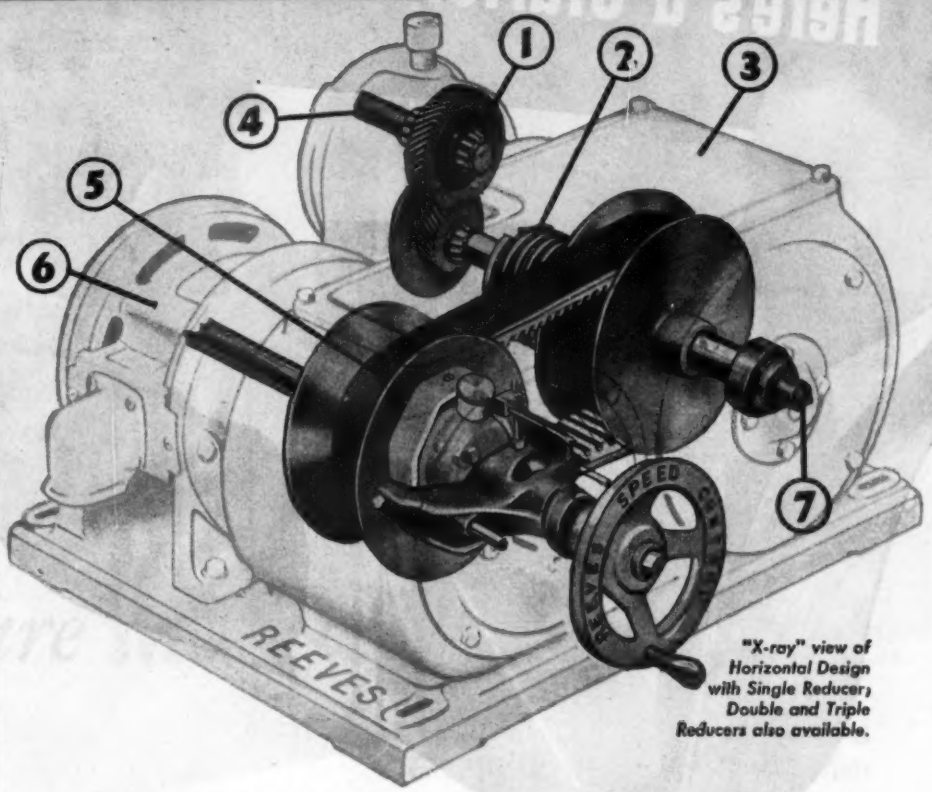

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REEVES *Accurate Variable* Speed Control

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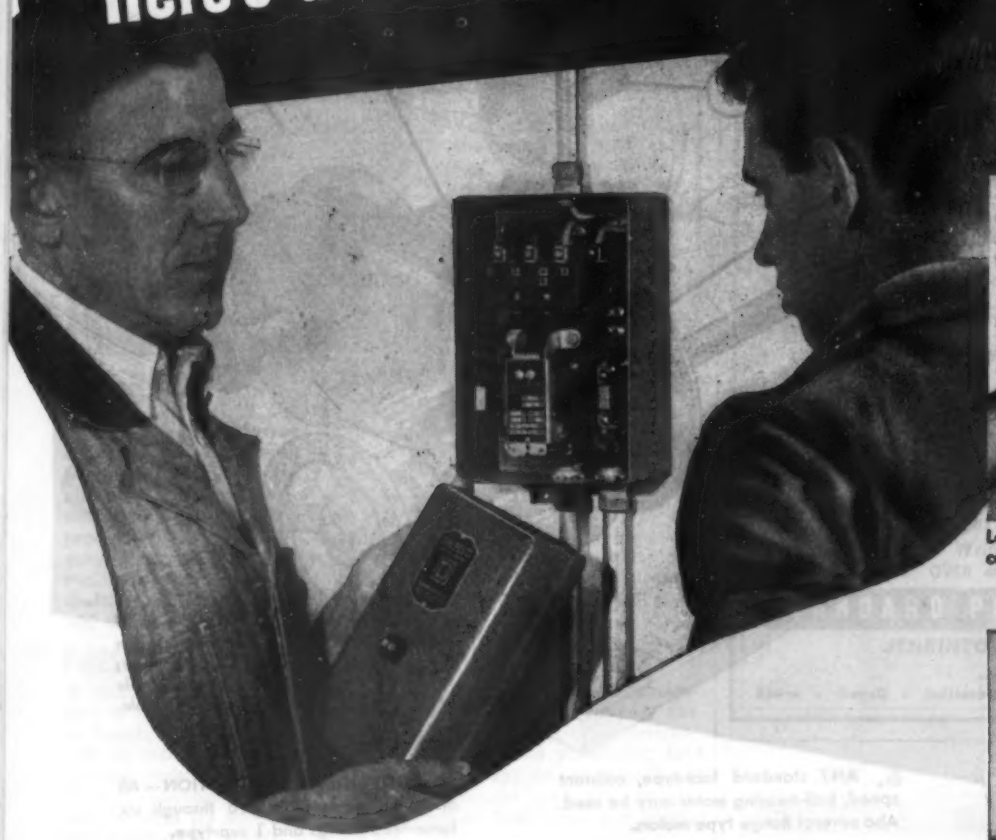
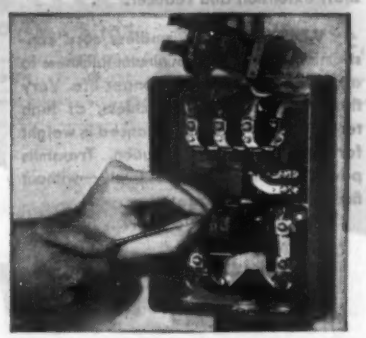
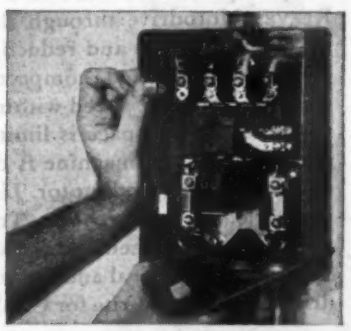


Loosen two screws and the arc chamber cover comes off. You can inspect every contact surface at a glance.



The entire armature and movable contact assembly can be lifted off after two more screws come out. You can easily slip off the magnet coil after disconnecting two wires from its screw type terminals.



Contacts are attached with separate screws—you can remove or replace them without disturbing any wiring—and a screw driver is all you need.

Peak operating efficiency and long life of electric motor starting equipment depend largely upon regular inspection and occasional servicing. Today, with every minute at a premium, this inspection and servicing job is more important than ever.

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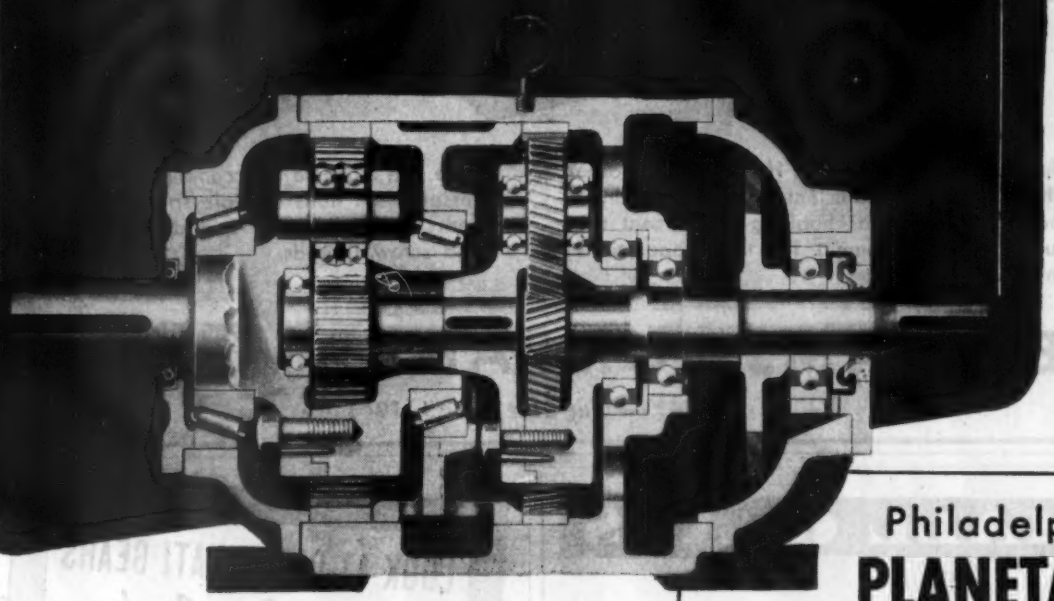

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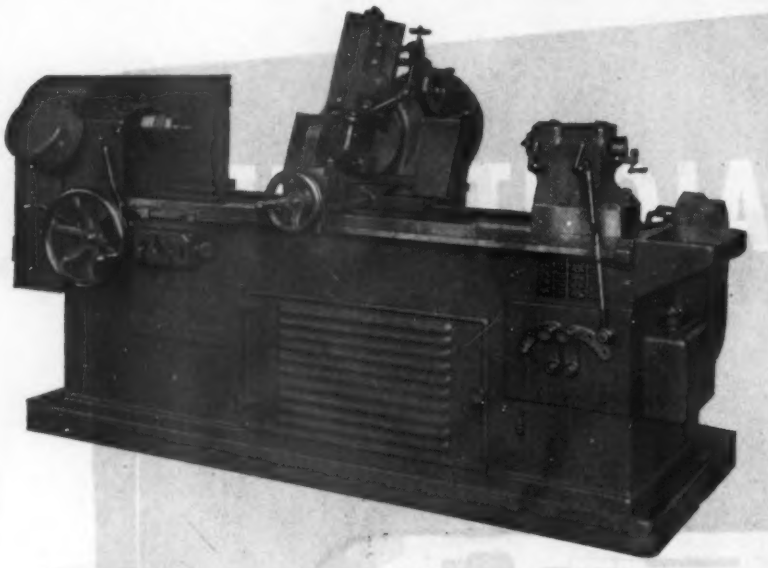

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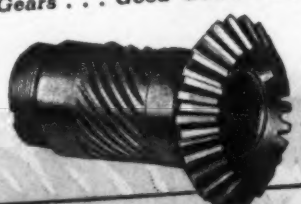
- HELICAL
- SPLINE
- WORM
- SPECIAL



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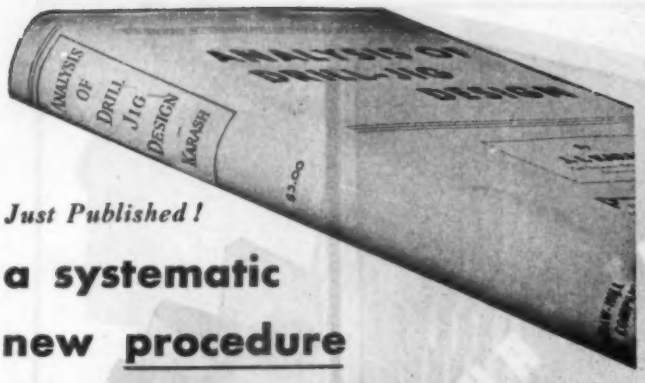

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A systematic procedure of tool design that makes easier and more productive the mental steps in producing the best tool for the job.

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By J. I. KARASH

Plant Engineer, Reliance Electric & Engineering Co.

326 pages, 5½ x 8½, 243 illustrations, $3.00

CONTENTS

1. Outline of Design Practice
2. Gathering Information
3. Analysis of Drilling Operations
4. Division-of-work Decision
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6. Principles of Locating
7. Clamping
8. Secondary-operation Jig Features
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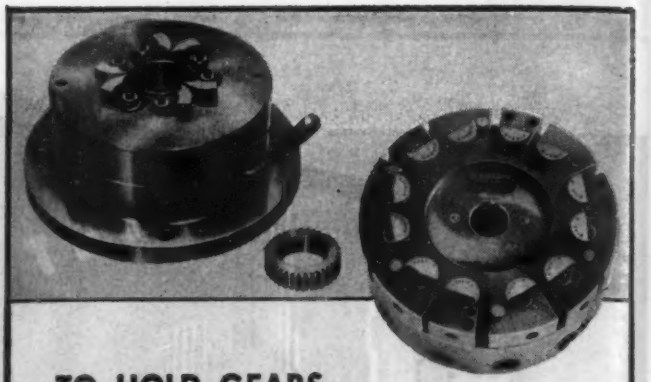

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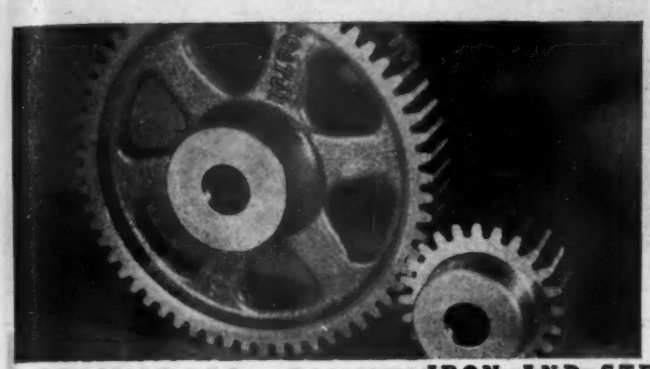
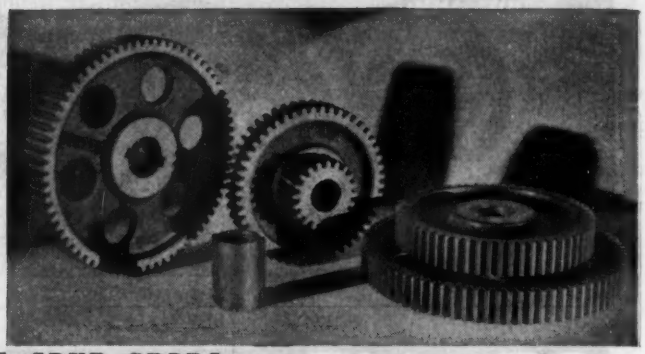
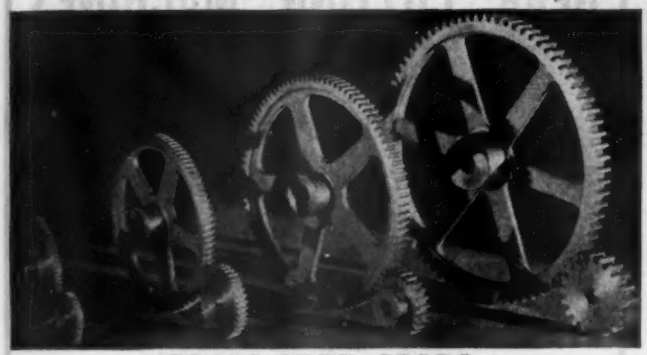
SPUR GEARS

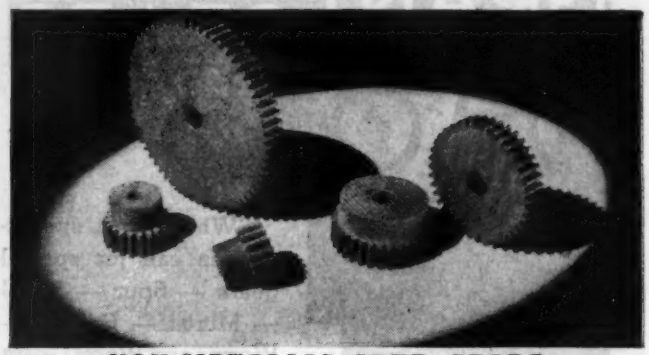




IRON AND STEEL SPUR GEARS



BRASS SPUR GEARS



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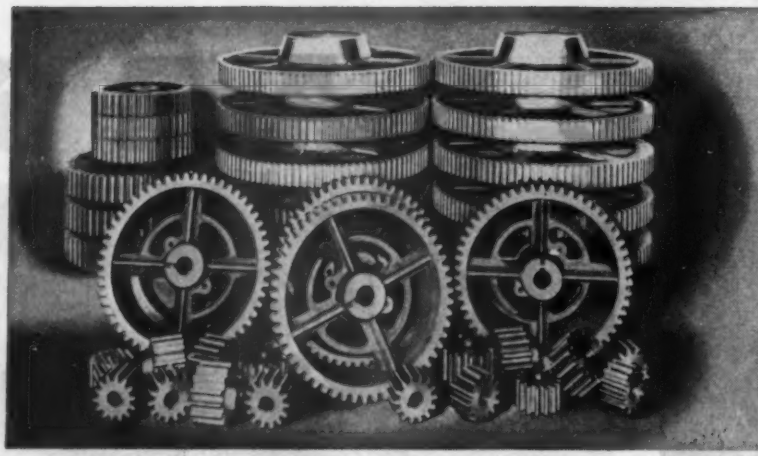

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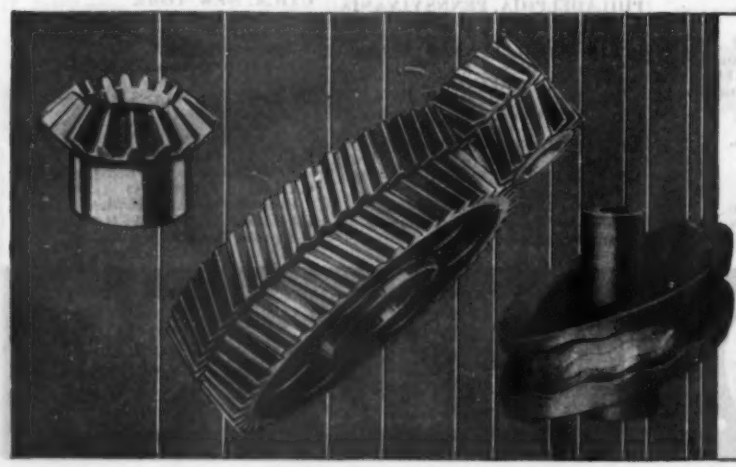

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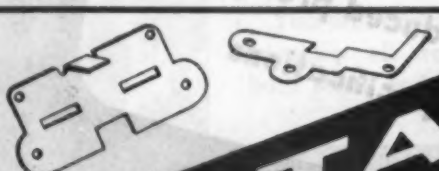

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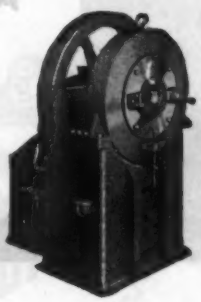

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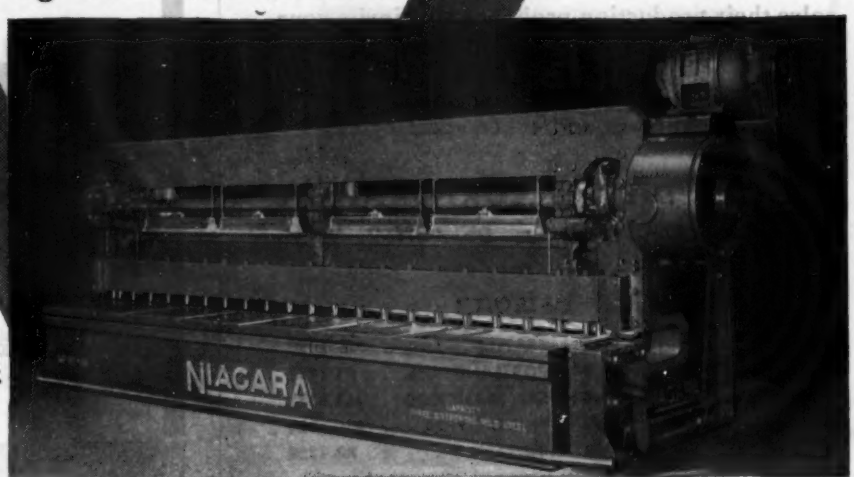

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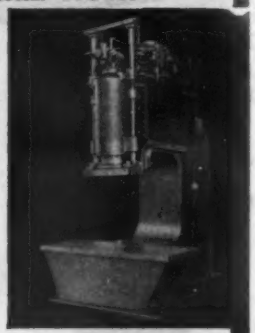

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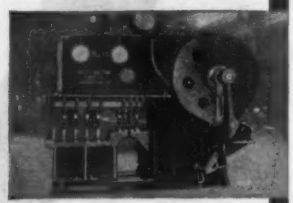
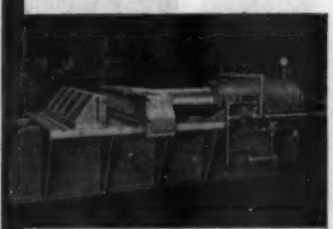


BEATTY Toggle type Beam and structural Punch with double gagged unit.



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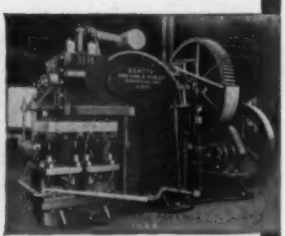

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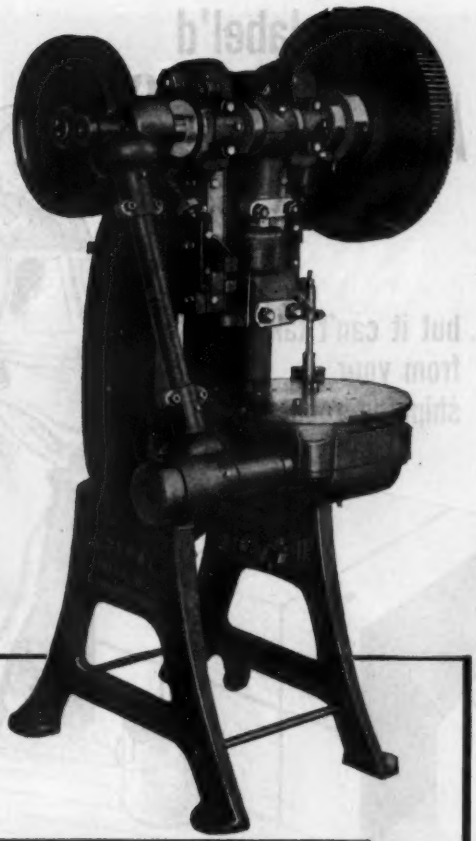

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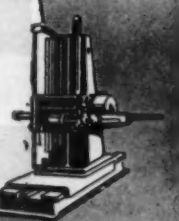

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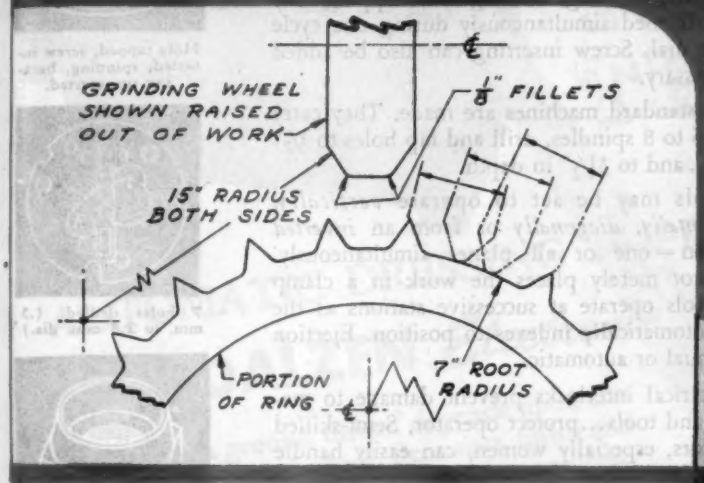
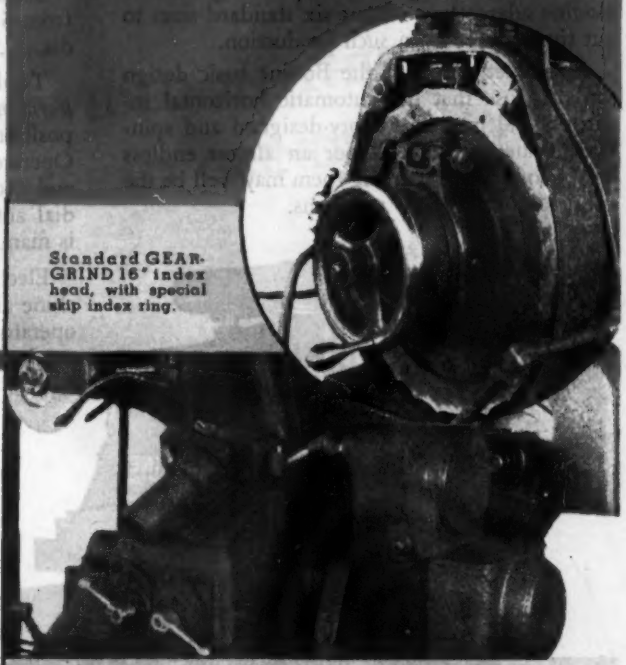
GEARGRIND MACHINE
Solves Unusual Problems
IN FORMED WHEEL TRIMMING AND INDEXING





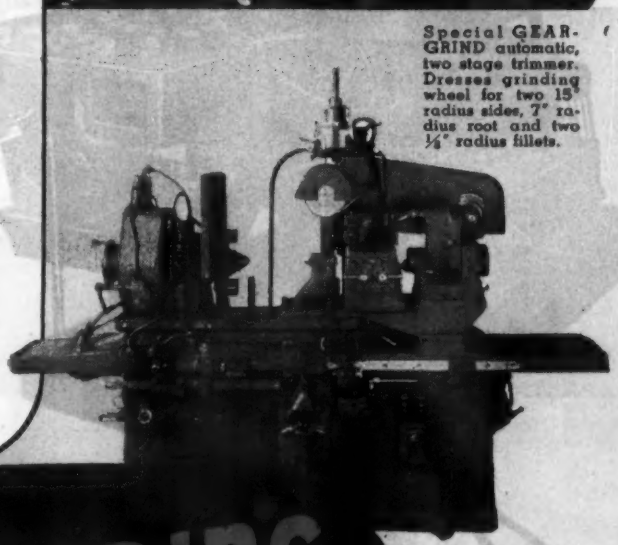
Standard GEARGRIND 16" index head, with special skip index ring.

THE WORK consists of a cam-like ring with both uniform spacing and large gaps between the cam lobes in which the root radius is finished by overlapping cuts of the grinding wheel.

Trimming the grinding wheel, having five radii, is accomplished with only three diamonds in a special two-stage automatic trimmer. In the first stage, both sides of the wheel are trimmed to a true 15" radius, using radius arms one-quarter the length of the radius. In the second stage the root radius and small fillets are trimmed automatically, all five radii blending perfectly.

This set-up enables the manufacturer to achieve the necessary production on these rings, with the close tolerance required and the fine ground finish associated with GEARGRIND machines.

Our engineering department is glad to discuss all problems which involve new applications of Formed Wheel Grinding. We design and build special GEARGRIND machines for special purposes, as well as the standard machines for the production of external and internal gears, external and internal involute splines, straight splines, serrations and racks.



Special GEARGRIND automatic, two stage trimmer. Dresses grinding wheel for two 15° radius sides, 7" radius root and two 1/4" radius fillets.

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

Manufacturers of the
RZEPPA
Constant Velocity Universal Joint.

PLAN NOW WITH *Bodine* FOR POST-WAR CONVERSION

This message is directed to engineering and production executives who foresee the trend of their post-war conversion.

If high-speed, multiple spindle production of small parts is a requirement of new manufacturing schedules, we offer you the cooperation of Bodine engineers in planning suitable Bodine adaptations of our six standard sizes to cut time and costs in such production.

An investigation of the Bodine basic design will disclose that the automatic horizontal indexing dial may be factory-designed and spindles located to provide for an almost endless variety of set-ups. Among them may well be the ideal solution of your problems.

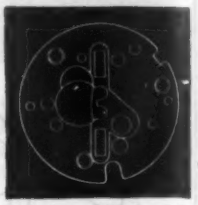
For high-speed repetitive production, especially where several operations are required on each part, Drilling, Milling and Tapping may be performed simultaneously during one cycle of the dial. Screw inserting can also be added if necessary.

Six standard machines are made. They carry from 6 to 8 spindles, drill and tap holes to ½" dia. . . . and to 3½" in depth.

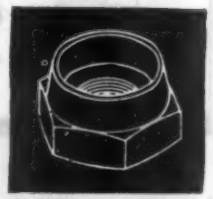
Tools may be set to operate *vertically, horizontally, diagonally* or from an *inverted* position — one or all planes simultaneously. Operator merely places the work in a clamp and tools operate at successive stations as the dial automatically indexes to position. Ejection is manual or automatic.

Electrical interlocks prevent damage to machine and tools...protect operator, Semi-skilled operators, especially women, can easily handle production at low fatigue factor.

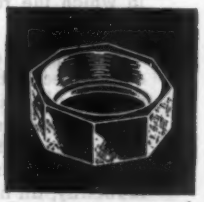
Hole tapped, screw inserted, spinning, backing up, ejected.



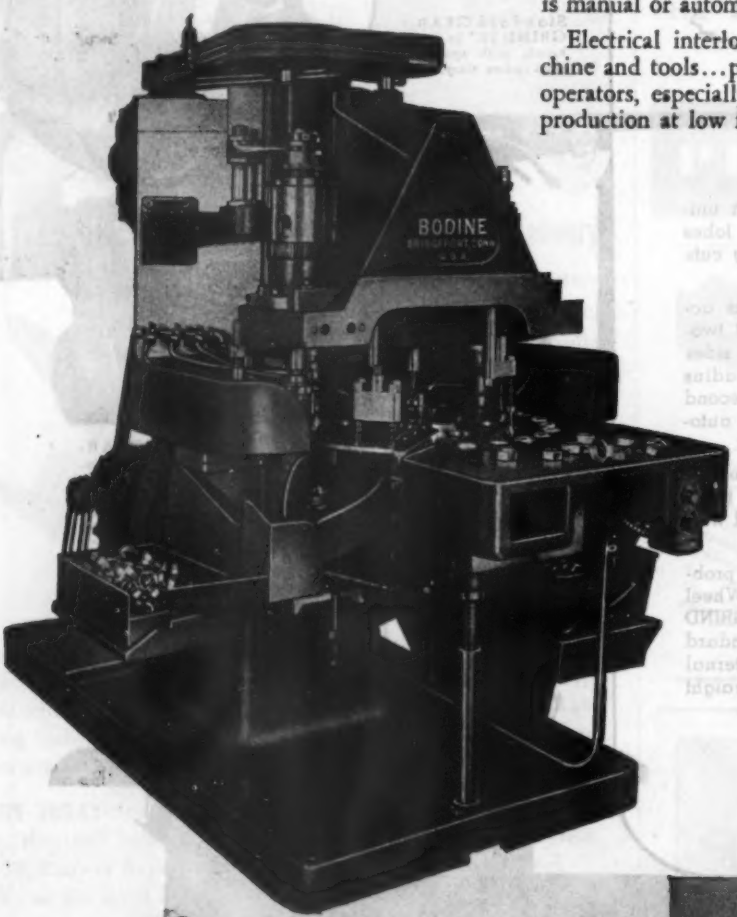
7 holes drilled. (.5 mm. to 2.8 mm. dia.)



Drilling and tapping—2 nuts to each stroke of machine.



Ream 2 diameters and seat — tap 1 9/16" — 12 T.P.I.



TYPICAL OPERATIONS

The four small parts shown herewith are typical of the work Bodine machines are doing at high speeds and with great accuracy. The number of operations which may be performed on each piece during one cycle of the dial is limited only by the number of spindles — 4 on the smallest machine — 8 on the largest.

Bodine machines are now available only for war work but their use has greatly increased. They are destined to take a prominent place in post-war production of small articles because of their demonstrated efficiency in turning out millions of ordnance components at low cost.

May we suggest that you investigate Bodine machines at an early date. Our engineers will gladly make recommendations from your blueprints or sample parts.

***Write* FOR INFORMATIVE BULLETIN**

DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

DALZEN THREAD GRINDER, No. 5, WITH GUARDS REMOVED

IN THREAD GRINDING . . . THE *DRESSER'S* THE THING!

AUTOMATIC DRESSING IS PROVIDED IN THIS *New* DALZEN *Electronic* THREAD GRINDER

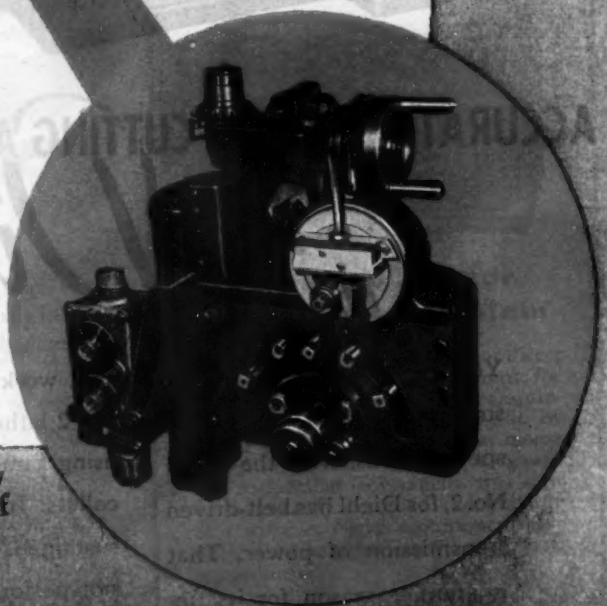
● Accuracy of a ground thread depends upon the accuracy of the dressed wheel. Precision, finish and production efficiency in thread grinding are determined primarily by the dresser.

DALZEN engineers always have recognized this fact. Now . . . the new DALZEN Electronic Thread Grinder presents the latest and best in dresser efficiency—offering new and special advantages in dressing performance.

The new DALZEN Thread Grinder with General Electric Thy-mo-trol drive provides maximum production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. It's an investment in *better* thread grinding, and a *low-cost* investment at that!

An attractive three-color folder describing the new DALZEN Models 5 and 6 will be sent you, free of charge, on request.

In addition to thread grinding machines, DALZEN also manufactures precision ground broaches, thread milling cutters, taps, threaded parts, and the Dalzen "2-in-1" combination center grinder and drill press. Write for descriptive literature.



DALZEN

TOOL & MANUFACTURING COMPANY

12255 EAST EIGHT MILE ROAD • • • DETROIT (5), MICH.

ACCURATE, SMOOTH CUTTING ASSURED with Diehl number 2

You are assured of accurate, smooth cutting, to exacting specifications, with the Diehl No. 2, for Diehl has belt-driven transmission of power. That is another reason for its unusual popularity among producers of precision products.

The Diehl No. 2 is standard size, working alongside other No. 2 lathes of standard make using same tooling, including collets. It is unsurpassed for sustained, high speed, precision performance, giving years of economical, vibration-free service with ample power to provide for extreme production requirements.

DIEHL NO. 2 LATHES ARE MADE IN 3 MODELS

- Power Feed to Turret—Screw Feed Cross Slide
- Power Feed to Turret—Lever Feed Cross Slide
- Hand Feed to Turret—Lever Feed Cross Slide

Automatic Chuck Capacity (round)	1"
Swing-over cross slide	6"
Swing-over bed	14"
Six speeds...forward and reverse	

WRITE TODAY FOR NEW ILLUSTRATED BOOKLET AND COMPLETE DETAILS

The G.M. DIEHL Machine Works, Inc.

WHERE PRECISION CRAFTSMANSHIP IS HONORED.

WABASH, INDIANA

SOME BABY!

SHE can whip more than her weight in U-boats, this Baby Flat Top (Escort Carrier) of the United States Navy! Designed originally for defense of American coasts and convoy lanes she quickly became a Number 1 weapon of attack.

Her success in sending fleets of fighters and torpedo-planes to exterminate Axis wolf packs in every sea contributes to the U. S. Navy's record as "the world's toughest customer".

Tough in battle, the Navy is likewise tough in selecting and purchasing equipment for fighting ships and men. Although she was created in a hurry by adding a flight deck to a merchant vessel or tanker hull, the Baby Flat Top is "Navy" from stem to stern. Her equipment is the stoutest that can be made; she fears no sea.

Building motors and motor generators for Baby Flat Tops is just part of Star's work for the Navy. And, while the Navy endorses no product, the fact that Star is able to meet rigid Navy specifications . . . is evidence of superior engineering ability and workmanship. Remember Star's Navy record when you need a motor or motor generator!

Star Electric Motor Co., 200 Bloomfield Ave., Bloomfield, New Jersey

SATISFYING THE WORLD'S TOUGHEST CUSTOMER

Ready NOW for Your Motor Problem

Motor generator above changes direct current into alternating current for operating gun turrets and other equipment on Baby Flat Tops, built by Kaiser Co., Inc. Like other Star motor generator sets used for Navy Degaussing and Radar equipment, this unit was especially designed and built by Star to meet Navy requirements for exceptional compactness, capacity and ruggedness.

This is proof of ability to handle any difficult motor problems that may confront you. If one of Star's standard motors (⅛th to 200 H.P.) does not meet your exact needs, Star has the "know how" to build a motor that will. Our engineers are ready now to discuss your post-war plans.

STAR MOTORS

POWER PACKAGED AS YOU NEED IT

L-W

High Speed

POWER HACK SAWS

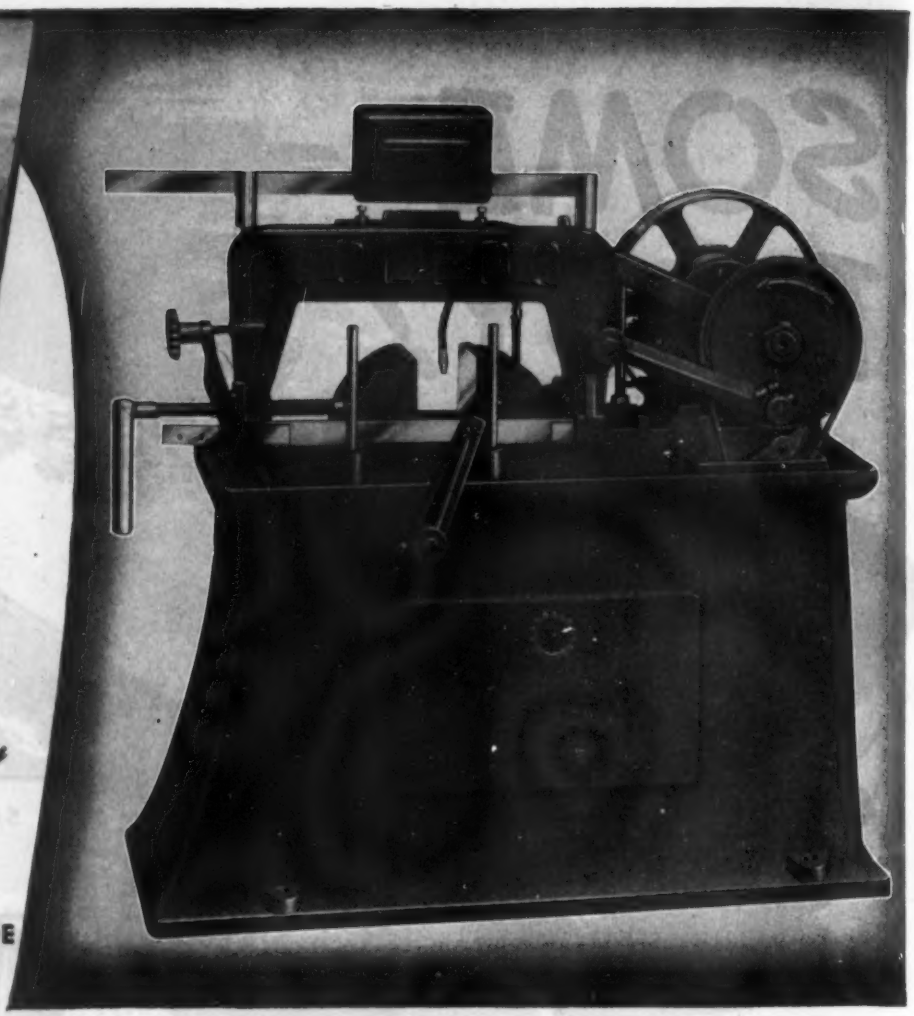
Low Price - High Quality

Immediate Delivery

The Ideal Saw for any Shop

GRAVITY FEED
LENGTH GAUGE
EXPANDING CLUTCH
DOVETAILED SAW FRAME GUIDE

$180.15



● Automatic trip stops machine on completion of cut . . . automatic relief of saw blade on non-cutting stroke . . . 6" x 6" capacity with 10" to 14" blades . . . Clutch pulley 12" x 3" . . . pulley speed 120 R.P.M. Saw frame is designed for maximum rigidity. Sliding bearing is dovetailed to fit arm and is adjustable in all directions. Belt drive type, $180.15.

Furnished on request, is the 3-speed V-belt Motor Drive arrangement to permit speed adjustments from 90 R.P.M. to 130 R.P.M.; motor, additional.

Motor recommended for use with drive arrangement— ½ H.P. standard speed, 1725 R.P.M.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY

5 N. ST. CLAIR ST.
TOLEDO 4, OHIO

NATCO *Adjustable Spindle* WAY-TYPE MACHINE

a TYPICAL EXAMPLE

THIS heavy-duty NATCO two-way horizontal machine drills 117 holes simultaneously in a cylinder head by progressive operations between the upper and lower deck of the fixture. Several sizes of cylinder heads are drilled on this machine. A rearrangement of the slip spindles quickly adapts the machine to a change in the design of the part.

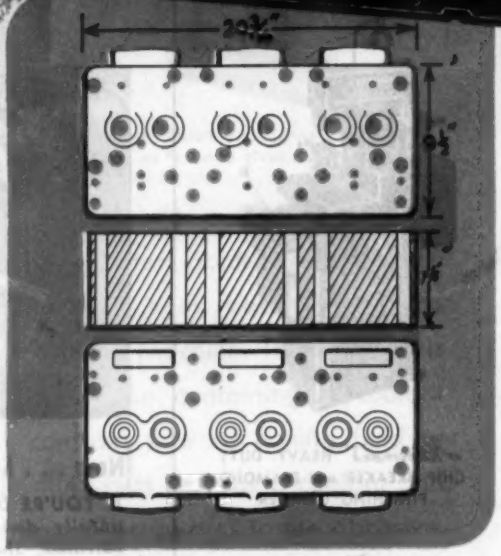
The set-up illustrated here is for drilling holes in the top and bottom of a cast-iron cylinder head. These holes vary in diameter from 3/16" to 15/16" and in depth from 5/8" to 6 3/16".

Many other NATCO way-type machines are illustrated and described in our literature which is yours for the asking.

SPEED, ECONOMY, PRECISION

NATCO way-type machines function automatically in processing multiple holes. They speed production and reduce costs. Precision is assured by automatic control which holds human error to a minimum.

You are invited to send us your blueprints or have our field engineers make a survey of your requirements.



The above diagrams show the holes processed by the NATCO two-way machine in the top and bottom of a cylinder head.

One part is loaded in each deck of the two-deck fixture. The part is first loaded in the lower deck where part of the operations are performed and then reloaded in the upper deck where the balance of the operations are completed. With a part in each deck of the fixture, one completed part is produced each cycle of the machine.

Left-hand unit drills 30 holes in the top of the cylinder head—4 of 9/16" dia.; 14 of 11/16" dia.; 10 of 21/64" dia.; 2 of 3/16" dia.

Right-hand unit drills 42 holes in the bottom of the cylinder head—4 of 9/16" dia.; 20 of 11/16" dia.; 3 of 15/16" dia.; 12 of 5/16" dia.; 4 of 21/64" dia.

The 12 bolt holes go through the cylinder head which is 7" thick. They are drilled half-way from each side.

All operations are automatic from a push-button start.

Production, 24 parts per hour

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND.

MULTIPLE DRILLING, BORING, AND TAPPING MACHINES

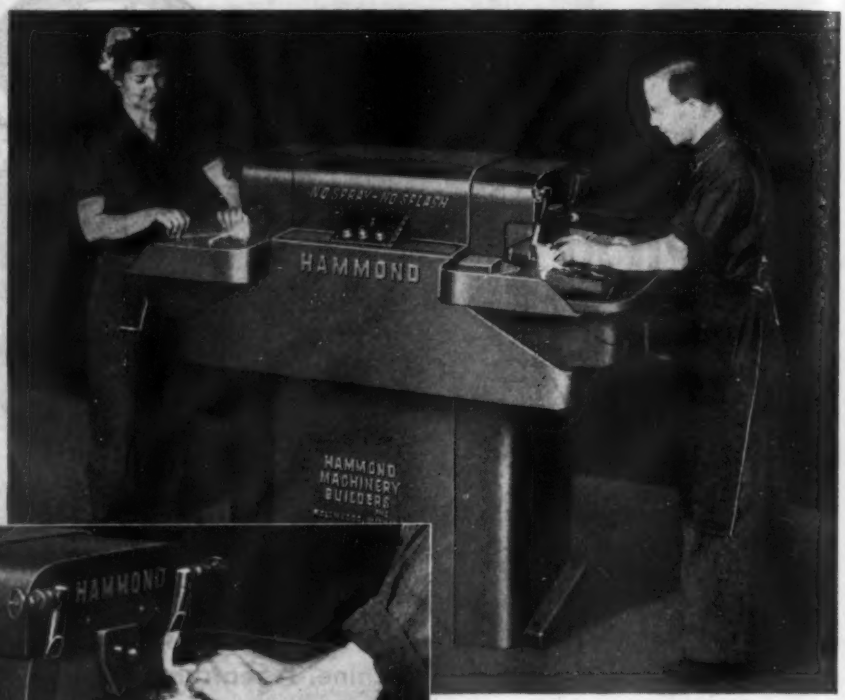
INVESTIGATE NATCO METHODS FOR THE LOWEST POSSIBLE HOLE COSTS!

SALES OFFICES: 1809 ENGINEERING BLDG., CHICAGO; 409 NEW CENTER BLDG., DETROIT; 1807 ELMWOOD AVE., BUFFALO; 2902 COMMERCE BLDG., NEW YORK CITY.

Hammond CARBIDE TOOL GRINDERS

MOST COMPLETE LINE — For Grinding Chip Breakers . . . Rough and Finish Grinders

Hammond can furnish you the right grinder for your particular needs. 20" straight wheel wet grinder for high production grinding, 14" cup wheel grinders for tools of 1" shank or larger, 10" cup wheel grinders for tools up to 1" shank; 6" cup wheel grinders for rough grinding tools up to ⅝" shank, also an ideal finishing grinder for all size tools. Hammond can give you grinders for either wet or dry operations. *Your inquiry is invited—write today for bulletin 201-A.*



Hammond HEAVY DUTY CHIP BREAKER and DIAMOND FINISHING GRINDER

Hammond 6" CUP WHEEL ROUGHING and FINISHING GRINDER

New . . . Superior . . . Exclusive Features!

1. **YOU'RE DRY WHEN YOU GRIND WET**—*Scientifically designed No Spray—No Splash guards patented, standard equipment, and coolant flow control keeps the operator and floor dry.*

2. **SAFETY CUP DISC**—*All Hammond cup wheel grinders furnished with patented safety cup discs as standard equipment. It is the greatest safety unit ever installed on any carbide tool grinder . . . prevents operator getting fingers, or dropping tools, into cup of cup wheel.*

3. **FULL VIEW OF WORK**—*Maximum light and fullest operating freedom provided by latest engineering developments. No Spray—No Splash Guards are concealed and close to the wheel . . . safety cup discs recessed into cup of cup wheel move with table and wheel hood for wheel wear.*

4. **HEAVY DUTY CONSTRUCTION**—*Smooth, vibrationless grinding is assured through precision spindle construction incorporating oversize spindle and oversize bearings. All moving parts are wear-protected for long dependable performance.*

14" WET and DRY CARBIDE GRINDERS

LARGE WHEELS FOR FAST CARBIDE TOOL GRINDING

NO SPRAY — NO SPLASH CONCEALED WHEEL GUARDS

FULL VISIBILITY OF WORK

GREATER OPERATOR FREEDOM

SAFETY DISC IN CUP WHEELS

ADJUSTABLE COOLANT CONTROL

WRITE FOR BULLETIN 201-A

Hammond Machinery Builders INC.

1618 DOUGLAS AVE., KALAMAZOO 54, MICH.

EASTERN BRANCH: 71 W. 23rd ST., NEW YORK 10, N. Y.

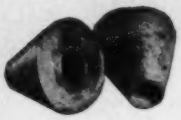
GREATER ACCURACY—MORE PRODUCTION ON PARTS LIKE THESE with the SUNNEN PRECISION HONING MACHINE

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

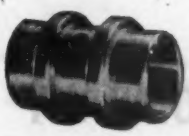
Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

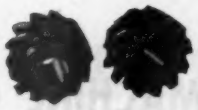
Saved time in producing a smooth accurate finish on this bronze remote control valve body.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Now you can get even greater accuracy and more production per hour than ever before with the improved Sunnen Precision Honing Machine. This machine is now furnished with a larger base containing a coolant pump, which provides a constant flow of honing fluid to the part being honed. The fluid acts both as a coolant and a lubricant, giving better honing properties to the abrasive. You get a smoother finish, more accurate work in less time.

Consider These Advantages, Too

- Hones and finishes internal cylindrical surfaces from .185" to 2.625"
- Can be used in any metal or plastic except lead or babbitt
- Does not require skilled labor
- Accuracy guaranteed within .0001"
- No jigs or fixtures needed
- Economical to operate
- Quickly and easily set up

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

Why not write today — asking a Sunnen engineer to show you how it can be used on your jobs — or ask for a bulletin giving complete information?

SUNNEN

SUNNEN PRODUCTS COMPANY, 7941 Manchester Ave., St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

THE TRADE MARK OF THE HENDEY MACHINE COMPANY

It is an identifying symbol on many thousands of Hendey Lathes and Shapers. These machines have been distributed all over the world wherever the metal working industry is found.

HENDEY LATHES IN BOTH PRECISION AND PRODUCTION TYPES ARE MADE IN 9″ TO 24″ SWING.

HENDEY CRANK SHAPERS IN HIGH SPEED AND HEAVY DUTY CLASSES ARE MADE IN 12″ TO 28″ STROKE.

We are ready to send you bulletins with full information on any or all sizes of both lathes and shapers.

1874 — 70 YEARS OF PROGRESSIVE MACHINE TOOL MANUFACTURING — 1944.

A Field in Which Experience Counts

THE HENDEY MACHINE COMPANY

TORRINGTON, CONN.

BRANCHES: BOSTON, NEW YORK, ROCHESTER, DETROIT, CHICAGO

Agencies in Principal Cities

Photo—Courtesy Aviation Ma

SETTING STUDS IN AIRCRAFT ENGINES with MODERN SELF-OPENING STUD SETTERS

Many aircraft engine builders are setting studs by the slow and costly hand method and have kept away from setting studs by power.

●

Packard are now using power and the Modern Stud Setter for driving 1/4" and 5/16" — studs in the upper crankcase of the Packard Rolls Royce Engine, which results in great saving in the cost of driving studs.

●

Full information on the Modern Stud Setter will be sent on request.

MODERN TOOL WORKS

DIVISION OF

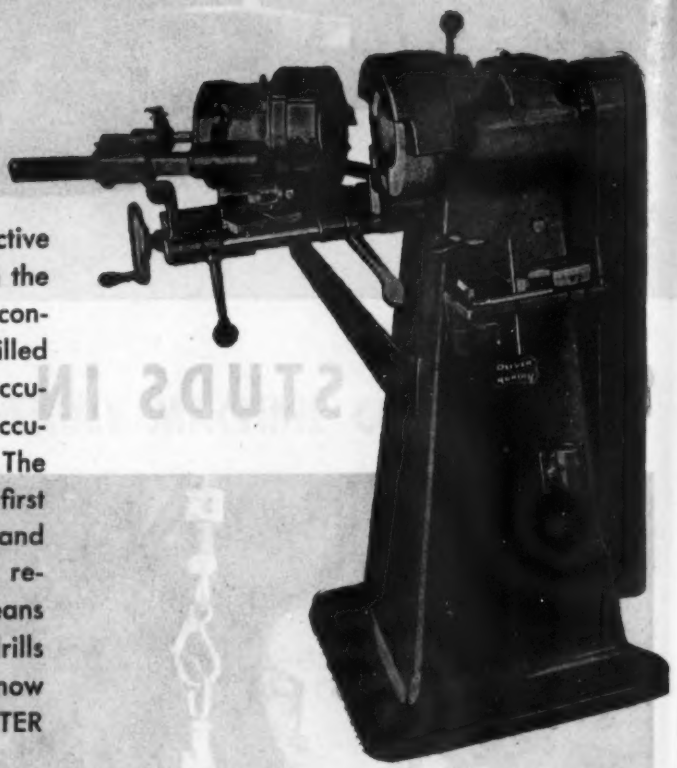
CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

MAKE DRILLS LAST LONGER

WITH THE

OLIVER DRILLPOINTER



You can be sure of getting the maximum productive life out of your drills, of getting lasting accuracy on the toughest drilling assignments — by keeping them in condition with the OLIVER DRILLPOINTER! Even unskilled operators can grind points that are mathematically accurate in every dimension, points that cut clean and accurately, reducing load on both machine and tool. The OLIVER DRILLPOINTER grinds a drill correctly the first time. Drill revolves continuously in view of operator and the process is stopped the instant enough metal is removed to renew the point. More holes per grind means fewer grinds — resulting in an important saving in drills in the course of a year. For production economies now and after reconversion . . . put the OLIVER DRILLPOINTER into service in your toolroom!

OLIVER INSTRUMENT CO., 1414 E. Maumee St., Adrian, Michigan

Above:

OLIVER NO. 510 DRILLPOINTER automatically produces patented Oliver variable point angles and variable clearances. Quickly set up for drills from ¼" to 3" dia., for any point angle from 82° to 160°.

Right:

OLIVER NO. 21 BENCH DRILL GRINDER, hand operated, for drills from No. 57 to ½". Attachments available for grinding oil hole drills, left-hand drills and special points.

Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

ABRASIVE No. M-34

VERTICAL SPINDLE GRINDER

MOTORIZED SPINDLE FOR **MORE POWER** AT THE CUTTING POINT

NEW Abrasive M34 Grinder packs five h.p. within its motorized spindle — ample power for every production need. Design minimizes vibration, eliminates gearing and belting and permits heavy cuts with a good finish. Engineered and built to Abrasive's high standards. Many new features. For complete information, send for bulletin.

Available for immediate delivery

ABRASIVE

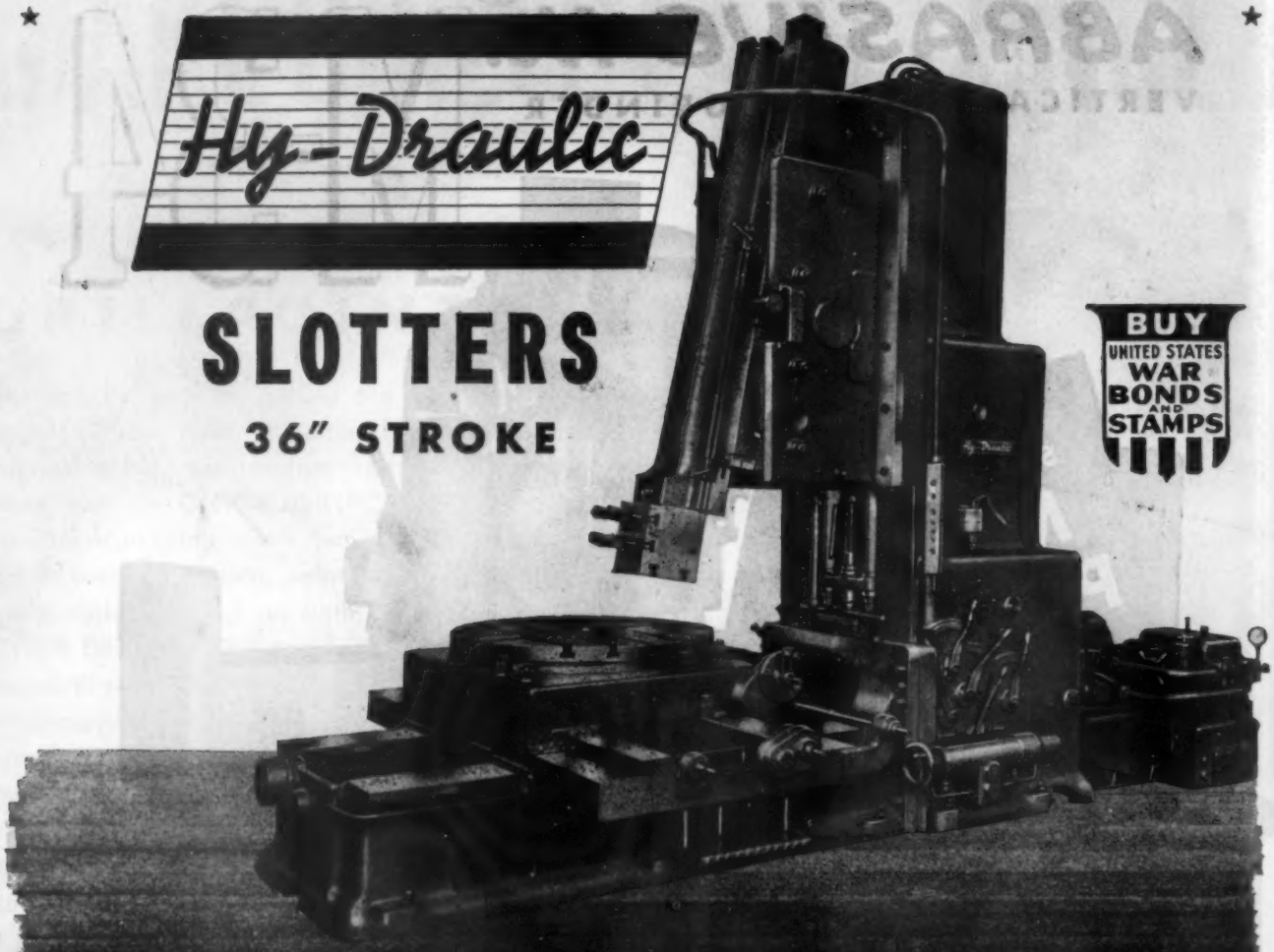
ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL COMPANY • EAST PROVIDENCE 14, RHODE ISLAND

Hy-Draulic

SLOTTERS

36" STROKE



BUY UNITED STATES WAR BONDS AND STAMPS

HAVE THE EXACT SPEEDS AND FEEDS YOU NEED FOR THAT WORK YOU WANT TO DO FAST

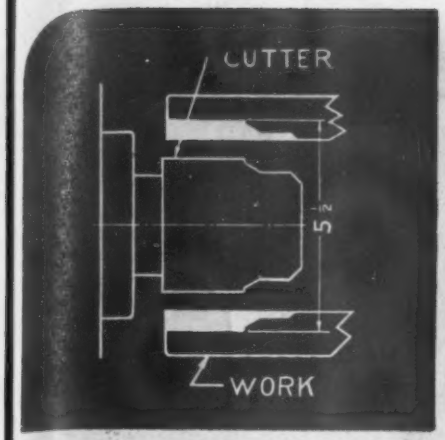
In Hy-Draulic Slotters there are no groups of speeds or feeds with gaps between to be bridged by gear-shifting. The cutting speeds and feeds can be adjusted to any rate whatever in specified ranges. The *exact* combination of speed and feed most effective on the work in process can be secured quickly and easily. It can be altered likewise to meet different conditions which may develop as the work progresses. High return ratio cuts the time between chips, speeds completion of every job.

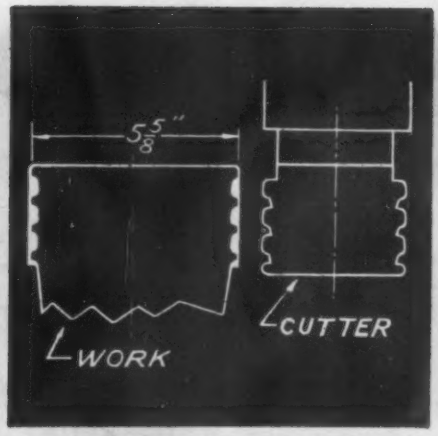
It is also easy to set up work quickly on Hy-Draulic Slotters. Ram-stroke and position are established in one simple manual operation. There are rapid traverses in all directions. Handy centralized controls govern all power operated movements.

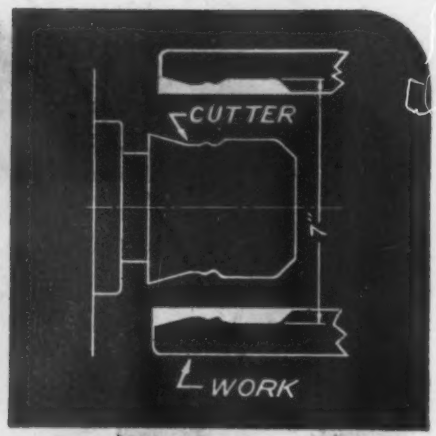
Hy-Draulic Slotters are accurate, powerful, fast, versatile, durable. They pay for themselves quickly on current work and present many additional profit possibilities for years thereafter. Investigate. Write, today, for Bulletin 1115.

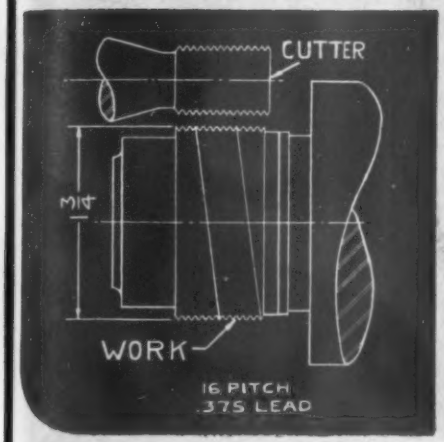
4600

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS









For Victory Today—Prosperity Tomorrow—

LOOK TO PLAN-O-MILL

For exceptional speed, accuracy and finish—at a saving of money, metal and manpower—look to Plan-O-Mill!

Plan-O-Mill provides a *better* method of form and thread milling. Plan-O-Mill offers outstanding rapid-production features, including General Electric's Thy-mo-trol for separate and complete control of feed-in and feed-around. Plan-O-Mill requires a minimum of skill to operate, a minimum of operator attention.

Shown above are typical examples of Plan-O-Mill production applications. If your war or post-war products involve internal or external threading or cylindrical forming, replace obsolete, wasteful machines with Plan-O-Mill. Contact your machinery dealer or write direct.

First

PLAN-O-MI

FIRST to install General Electric's remarkable new Thy-mo-trol—electronic feed control!

FIRST planetary to mill external threads with standard multiple thread cutter!

FIRST planetary to coordinate feeds and speeds!

FIRST to provide absolute control of fe

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

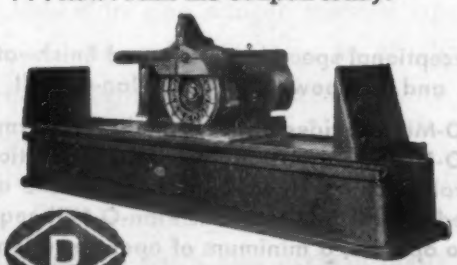
THREAD AND FORM PLAN-CO MILLING CUTTERS

FACE GRIND THIS STEEL CASTING? YES!

This piece—half a tiller for a ship's steering gear—is a steel casting. It's roughed out first by machining but facing to tolerance is done by face grinding.

Face grinding is primarily used because sand inclusions and hard spots break cutting tools and push tools aside, making it very difficult to get a straight, flat surface. But don't forget, face grinding with a Diamond Face Grinder also saves time—1 to 2 hours per piece, a worthwhile reduction. In short, *only* face grinding produces an economical, satisfactory job.

Incidentally, only ordinary back-up stops and clamps are needed for the set-up . . . no bracing. Check *all* the advantages of Diamond Face Grinders . . . now! Mail the coupon today.



Diamond Machine Company of Philadelphia
2405-D **Aramingo Ave., Philadelphia 25, Pa.**
Gentlemen: ☐ Send your Bulletin 44-G which shows how to step-up production with the Diamond Face Grinder.

Name_____
Company_____
Address_____ State_____
City_____

DIAMOND
MACHINE COMPANY
OF PHILADELPHIA

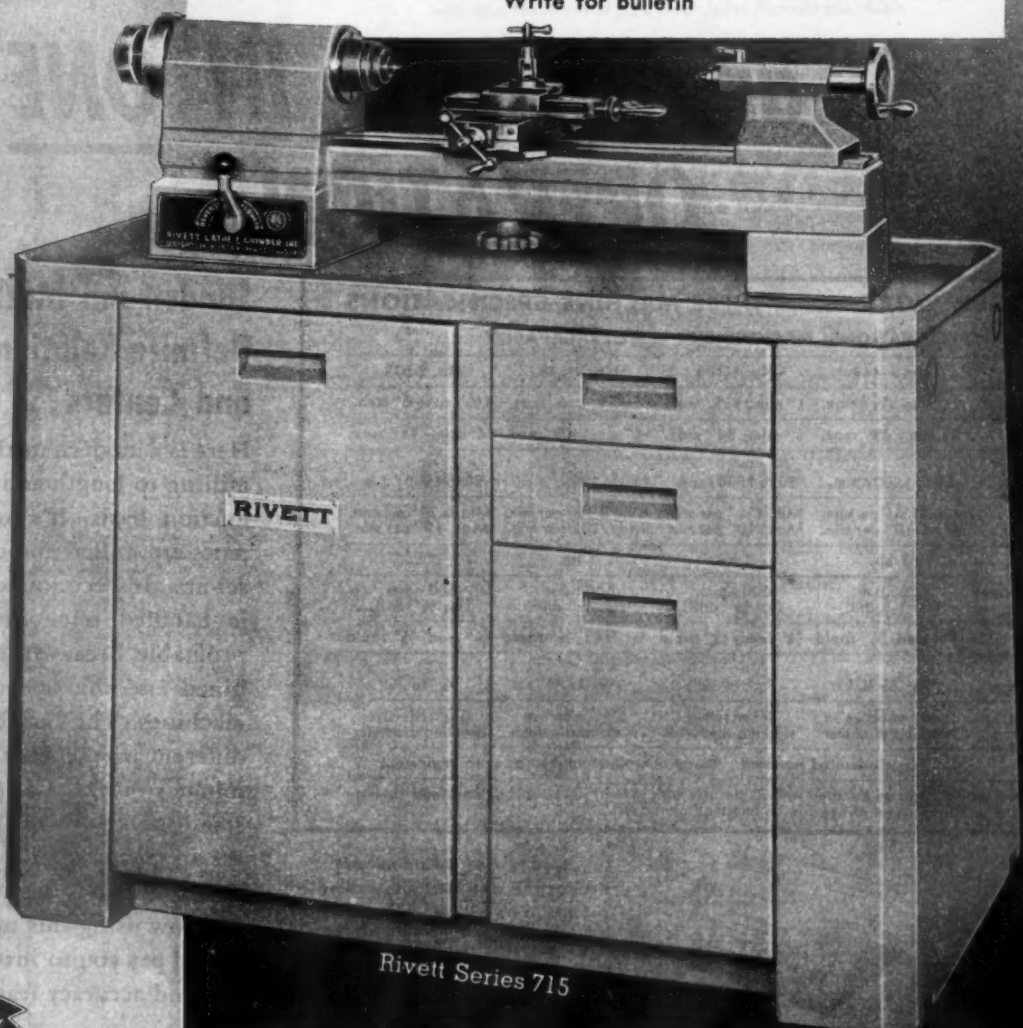
RIVETT

PLAIN BENCH LATHES FOR FINE FINISHING

The well equipped lathe department finds the modern Rivett plain bench lathe indispensable for fine finishing operations. The Rivett balanced design, power and speed range have brought the bench lathe and its precision out of the tool-room into production. Many operations formerly done on heavy, costly machines are now being properly routed to bench lathes.

Selection can be made from two sizes of Rivett plain bench lathes complete with their mountings, drives and attachments. Series 918 has 9" swing, 18" center distance and 1" collet capacity. Series 715 has 7" swing, 15" center distance and ¾" collet capacity.

Write for Bulletin



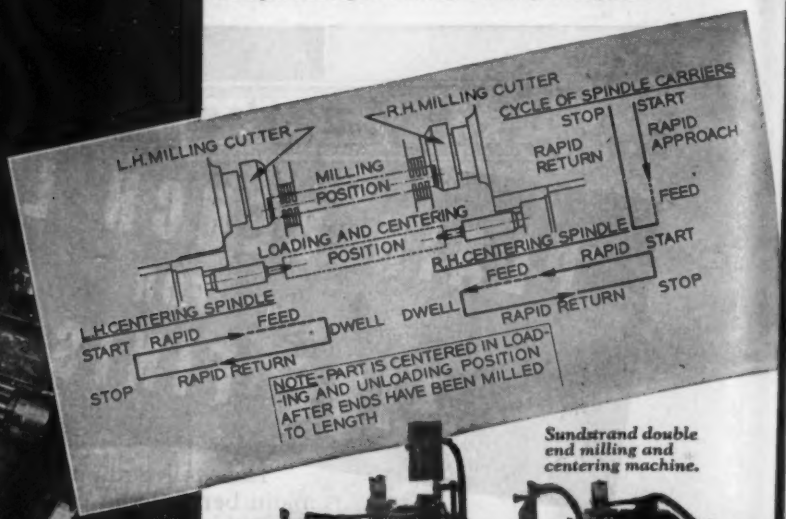
Rivett Series 715

ARMY E NAVY

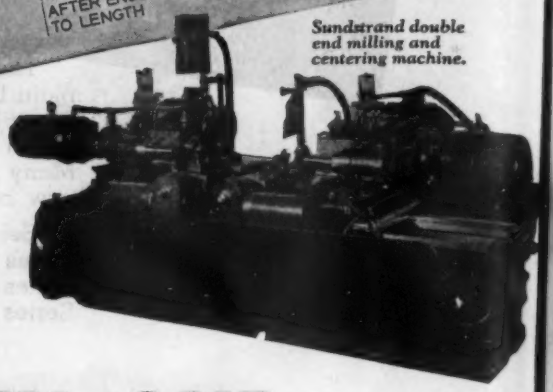
RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

Centering spindles automatically rapid traverse, feed to depth and rapid return after milling is completed.



Sundstrand double end milling and centering machine.



MILL TO LENGTH and CENTER IN ONE OPERATION . . .

CHECK YOUR WORK WITH THESE MACHINE SPECIFICATIONS

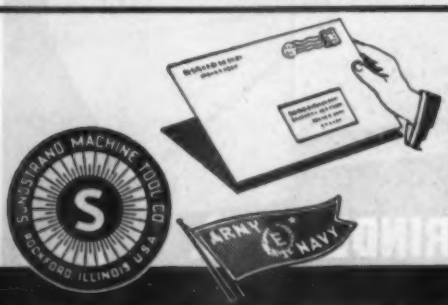
SPECIFICATIONS: MACHINE SIZE—WORK CAPACITY

	No. 1-448	No. 1-484	No. 2-648	No. 2-672
Diameter—Min....	1" min., 3½" max.	1" min., 3½" max.	1⅛" min., 6" max.	1⅛" min., 6" max.
Length—Min.*....	8" min., 48" max.	8" min., 84" max.	14" min., 48" max.	14" min., 72" max.
Milling Head Speeds.....	20 to 1200 r.p.m.	20 to 1200 r.p.m.	20 to 1200 r.p.m.	20 to 1200 r.p.m.
Feed Rate.....	Min. 1¼" per min. Max. 10" per min.	Min. 1¼" per min. Max. 10" per min.	Min. 0.72" per min. Max. 10" per min.	Min. 0.72" per min. Max. 10" per min.
Horsepower.....	3 hp.	3 hp.	5 hp.	5 hp.
Center Drill—Speed	600 r.p.m. (for ⅜" drill)	600 r.p.m. (for ⅜" drill)	600 r.p.m. (for ⅜" drill)	600 r.p.m. (for ⅜" drill)
Feed Stroke.....	¾" feed, ⅝" rapid	¾" feed, ⅝" rapid	¾" feed, ⅝" rapid	¾" feed, ⅝" rapid
Cutter Sizes—Center Drills.....	⅜" to ¾"	⅜" to ¾"	⅜" to ¾"	⅜" to ¾"
Milling Cutters.....	4" effective working diameter	4" effective working diameter	6½" effective working diameter	6½" effective working diameter
Vises	Screw operated standard. Power operated furnished as extra equipment.			

*Work shorter than 8" can be handled with single vise with special jaws. Speeds and feed strokes other than the standard shown above can be furnished on request.

Sundstrand Machine Maintains Definite Relation Between Ends and Centers . . .

Here is a modern method and machine for milling to length and centering on a production basis. It's accurate because the parts are milled and centered in the same set-up. It's economical, because the part is handled once instead of twice. It's profitable, because the operations are combined and the operator can run several machines. The head can be adjusted for different part lengths in approximately 20 minutes—making it profitable to include small as well as large lot sizes. Manufacturers of tractors, farm implements, aircraft parts, automobiles and Diesel engines are now using this machine to advantage. It will pay you to investigate the time saving and accuracy features of this machine.



How to Get a Preliminary Production and Machine Estimate

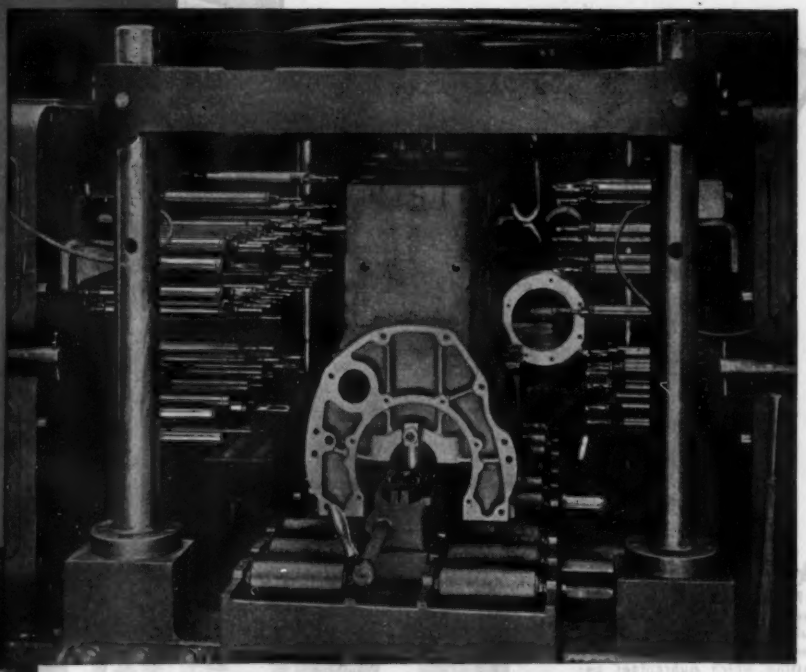
Our engineers will be glad to assist in determining the proper machines required for your milling and centering operations. Merely send us your part prints giving production and operations required. There is no obligation.

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

$12,500 PER MONTH SAVED ON CYLINDER BLOCK DRILLING AND TAPPING OPERATIONS



Special tapping heads and holding fixture designed and built by manufacturer for W. F. and John Barnes machine.

Cylinder block being drilled on W. F. and John Barnes machine.

PRODUCTION INCREASED FROM 720 TO 2000 CYLINDER BLOCKS PER MONTH

Machining blocks by former methods including single spindle drilling and tapping machines cost this manufacturer $13.75 each. By installing three Barnes machines to do the drilling and tapping operations only, total unit cost was reduced to $7.50. Production jumped from 720 blocks to 2000 blocks per month with a gross savings of $12,500 per month.

The manufacturer designed and built the drilling and tapping heads required for the cylinder block. Barnes built the machines to accommodate these special heads. It was through this collaboration of the manufacturer's engineers and Barnes' engineers that it was possible to build these three machines.

Regardless of how complicated or difficult you consider your machining problems, it is possible they may be readily solved by consulting our engineers. Just submit your problems to us, recommendations will be made without obligation.

FREE DESCRIPTIVE DATA

How boring, drilling, reaming, tapping and milling operations can be done simultaneously is described in thirteen helpful booklets. This useful information shows how W. F. and John Barnes machines are designed to meet specific requirements. Write today for this data which may suggest a tooling or production set-up for you — ask for Bulletin No. 1144A.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

Joe:

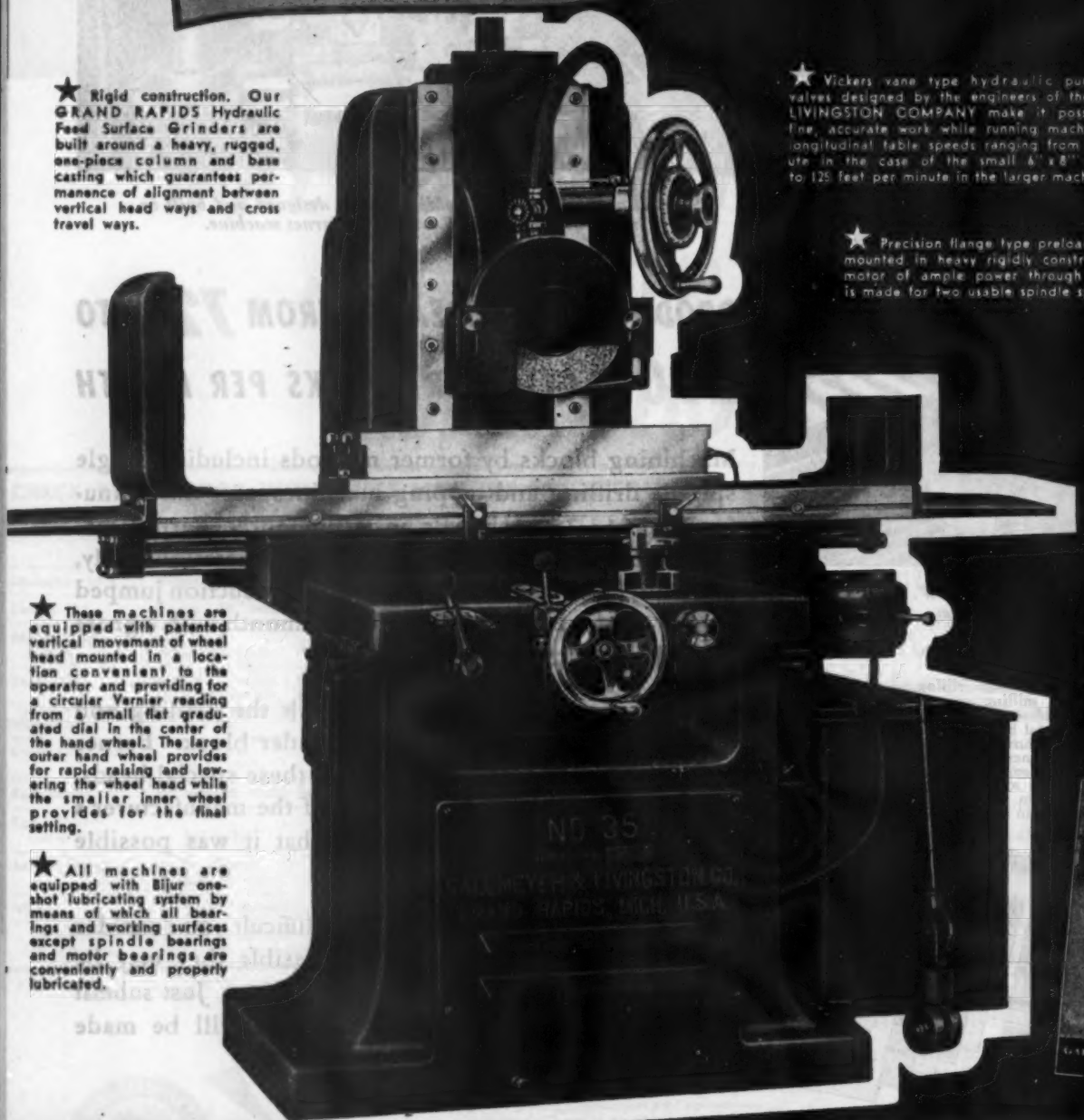
HERE IS WHY PRECISION SURFACE GRINDING IS NO LONGER THE BOTTLE NECK IN YOUR TOOL ROOM

Bill

★ Rigid construction. Our GRAND RAPIDS Hydraulic Feed Surface Grinders are built around a heavy, rugged, one-piece column and base casting which guarantees permanence of alignment between vertical head ways and cross travel ways.

★ Vickers vane type hydraulic pumps and control valves designed by the engineers of the GALLMEYER & LIVINGSTON COMPANY make it possible to produce fine, accurate work while running machines at maximum longitudinal table speeds ranging from 80 feet per minute in the case of the small 6" x 8" capacity grinder to 125 feet per minute in the larger machines.

★ Precision flange type preloaded ball bearing spindle mounted in heavy rigidly constructed head is driven by motor of ample power through vee-belts and provision is made for two usable spindle speeds.



★ These machines are equipped with patented vertical movement of wheel head mounted in a location convenient to the operator and providing for a circular Vernier reading from a small flat graduated dial in the center of the hand wheel. The large outer hand wheel provides for rapid raising and lowering the wheel head while the smaller inner wheel provides for the final setting.

★ All machines are equipped with Bijur one-shot lubricating system by means of which all bearings and working surfaces except spindle bearings and motor bearings are conveniently and properly lubricated.

★ If you are interest in modern high-spee Hydraulic Feed Surfa Grinders in which to room accuracy is combin with production spee we suggest that you for bulletin GL-100.

GALLMEYER & LIVINGSTON CO

330 STRAIGHT AVE. S.W.

GRAND RAPIDS, 4 MICHIGAN

WALKER DOES IT AGAIN!

This NEW ALL PURPOSE MAGNETIC-ELECTRIC LONGITUDINAL POLE CHUCK

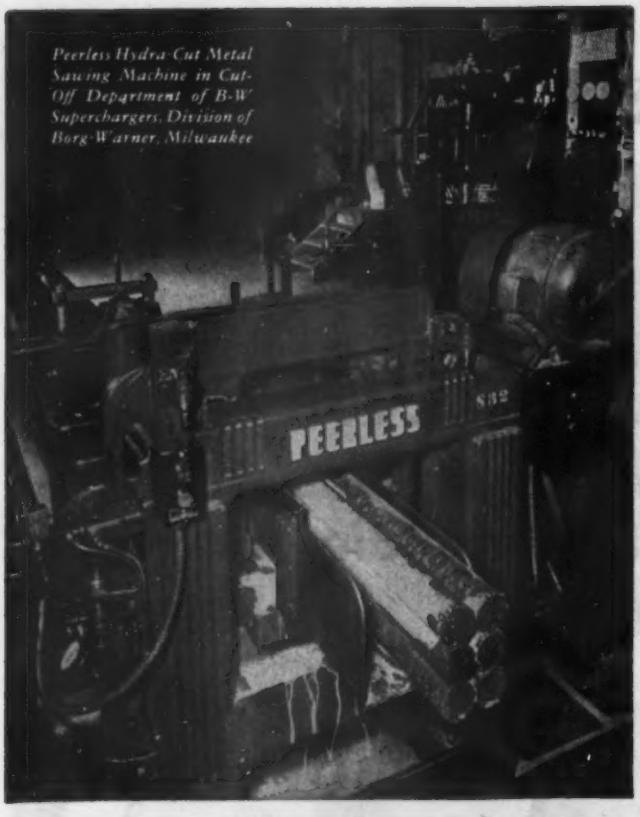
. . . *supersedes the old Bar Pole design*

ONCE more WALKER applies its long specialized experience to pioneer this most recent development in Magnetic Chucks.

The New ALL PURPOSE LONGITUDINAL POLE CHUCK retains all the advantageous features of the outmoded bar pole conventional design which it replaces and in addition offers a construction which will withstand a lot of abuse and which is absolutely waterproof. It has the same fine pole divisions as those in chucks of the old transverse bar pole design.

The metal working industry has already furnished a proving ground for these new WALKER CHUCKS. On the basis of performance, efficiency and utility, their reception has been universally enthusiastic and their worth thoroughly demonstrated. It will be to your advantage to investigate immediately. WALKER ALL-PURPOSE ELECTRIC CHUCKS are available for early shipment in all sizes from 4" x 10" to 12" x 60". Write for further details.

O. S. WALKER COMPANY, Inc.
WORCESTER, MASS. U. S. A.



Peerless Hydra-Cut Metal Sawing Machine in Cut-Off Department of B-W Superchargers, Division of Borg-Warner, Milwaukee

AT B-W SUPERCHARGERS BAR STOCK IS CUT WITH A

PEERLESS

THIS Peerless Hydra-Cut Metal Sawing Machine, with automatic bar feed, is installed at the Milwaukee B-W Supercharger Plant of Borg-Warner.

Hydra-Cut machines will cut from 5 to 10 square inches of metal per minute.

That's Fast Sawing!

Ask your local Peerless dealer for the many reasons why the exclusive Peerless patented Four-Sided Saw-Frame with Backing Plate assures faster and straighter cuts . . . or mail coupon now.

PEERLESS
MACHINE COMPANY
RACINE · WISCONSIN

Dept. AM-1144

Rush folders describing

☐ Peerless Hydra-Cut ☐ Peerless Utility Model
☐ Peerless Mechani-Cut ☐ Peerless Blades & Coolant

Firm_____

Name_____

Street Address_____

City_____ State_____

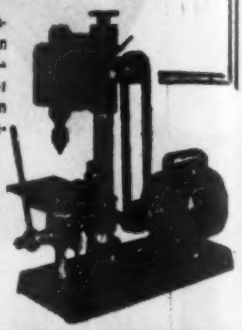
For Sensitive Tapping of Precision Work

HAMILTON-MUEHLMATT SENSITIVE TAPPING MACHINE

● Here's a high speed, sturdy little tapping machine which is especially adapted to precision tapping of light work. It is now being used very successfully for tapping parts for instruments, cameras, watches, clocks and business machines.

It has gained wide acceptance due to the high quality of work produced because of its particularly smooth operation without breakage of even the finest taps.

Mechanically simple and easy to operate, a man can become expert in an hour or so of operation. Quiet—no noisy reversing mechanism nor slinging of oil. Can be plugged in any light socket. For full information write for bulletin.



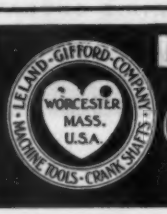
PERTINENT DATA

Capacity—From smallest and finest tap to 10-32 inclusive.
Power 1/8 H.P., 1750 R.P.M. Motor, A.C.
Tapping speeds approx. 1200 to 2500 R.P.M.
Size of machine—16 in. x 7 in. x 22 in. high
Weight—Approx. 60 pounds

The Hamilton Tool Co.

830 NINTH ST. HAMILTON, OHIO

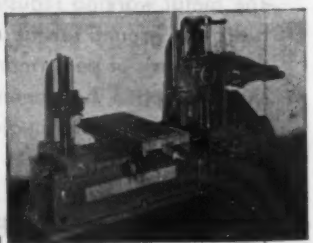
Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO



Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO.
WORCESTER, MASS.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

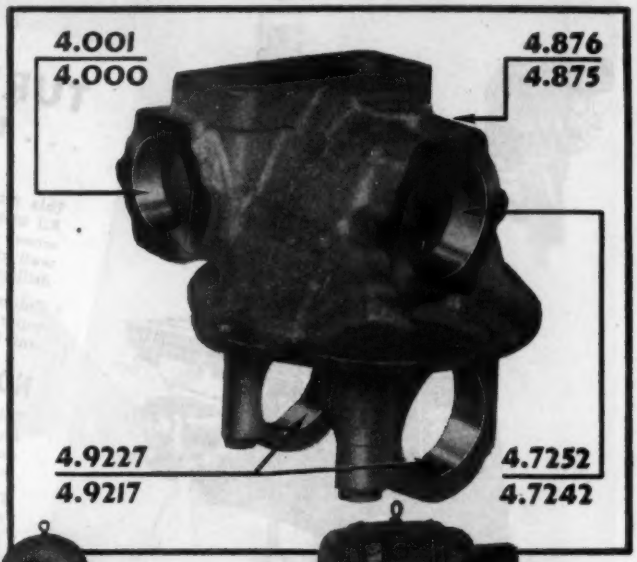
UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

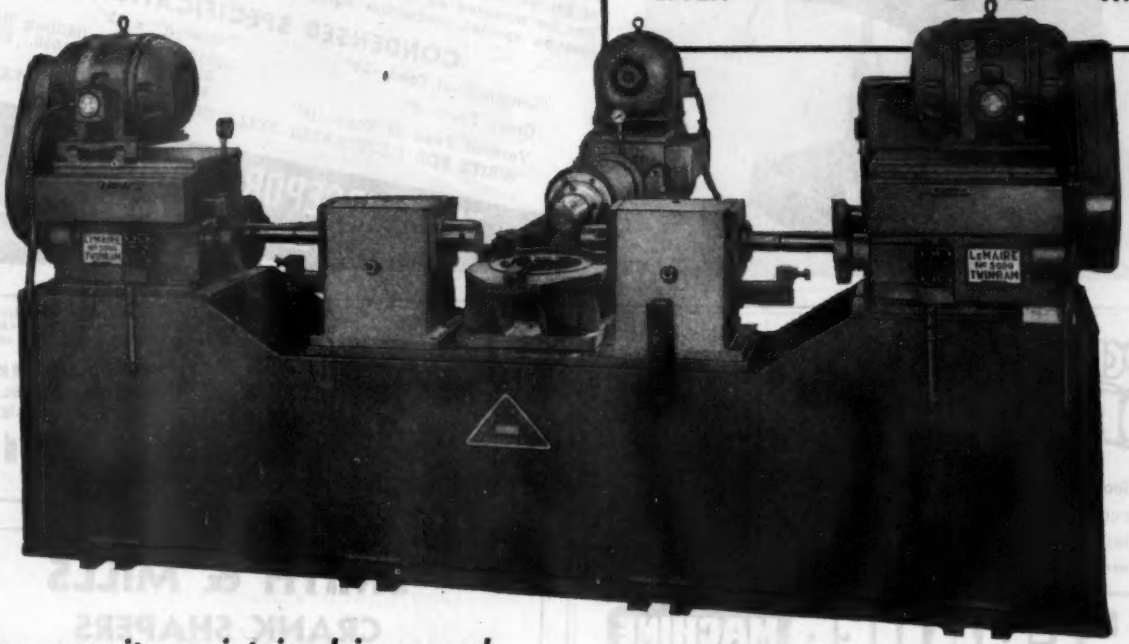
ANOTHER APPLICATION of LE MAIRE TWIN RAMS

34 Axle Mountings per hour

rough bored and finish faced in one setup . . .

on this new machine designed and built by LeMaire





Same capacity maintained in second run, which finish bores the parts to .001 tolerance

The truck axle mounting, or carrier, is located on a fixture in the middle of the machine. Two heavy-duty spindle quill assemblies rapid advance from opposite sides to rough bore and finish face a 4-inch hole on one side and a 4.8-inch on the other, while a two-spindle slide type boring head in the rear bores through two 4.9-inch holes. (Actual sizes and locations of holes are indicated in large photo.)

Three No. 5000 Twin Ram Hydraulic Units are employed to rotate and feed the tools—demonstrating further the unusual versatility of these powerful units. The variety of applications is almost limitless—which adds great economy to their high efficiency. The units can be interchanged from one base to another.

Perhaps your production can be simplified through the use of one or more of these units. It costs nothing to discuss these possibilities with our engineers.

BUY WAR BONDS

LeMaire

BUILDERS OF
SINGLE AND MULTIPLE SPINDLE MACHINES
FOR BORING, DRILLING, REAMING,
TAPPING, ETC.—TWIN RAM HYDRAULIC
UNITS—MATCH-IT GEAR CHUCKS

LEMAIRE TOOL & MFG. CO. • 2665 S. TELEGRAPH ROAD • DEARBORN, MICHIGAN

Bridgeport

TURRET MILLING MACHINE
. . . the all-purpose machine with unparalleled range of utility

This machine will mill, drill, bore and shape at all conceivable angles. All angular settings in one plane are achieved by merely turning hand wheel controlling keyed overarm. It has always been furnished with the well known Bridgeport High Speed Milling Attachment which provides for drilling and boring at all angles without changing work setup.

Column, knee and table are of rugged construction. Wide ways and taper gib assure accurate, vibration-free operation. Entire machine is anti-friction bearing mounted.

NOW EQUIPPED WITH NEW SHAPING ATTACHMENT

This new attachment on back end of overarm is of sturdy construction and can be set at all angles. It provides for shaping such work as large and small dies and molds as well as for intricate production jobs involving slotting operations.

The "Bridgeport" Shaping Attachment is now available to every owner of Bridgeport Turret Milling Machines. Shaping and Milling Attachments can be mounted on all types of milling machines. They are in extensive use on special production equipment.

CONDENSED SPECIFICATIONS

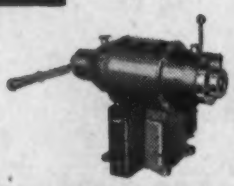
Longitudinal Feed—20"
Cross Feed—9"
Vertical Feed of Knee—16"
Table—8" x 32"
Spindle Speeds—(Milling Unit) 275, 425, 700, 1050, 2100, 4250

WRITE FOR ILLUSTRATED BULLETINS GIVING FULL DETAILS

THE BRIDGEPORT MACHINES, INC.
Bridgeport, Conn.

CHAUER
Speed Lathes

WRITE FOR CAT. 440



Ideal for secondary finishing operations on small metal and plastic parts • polishing • deburring • lapping • grinding.

SCHAUER MACHINE COMPANY

ORIGINATORS OF TODAY'S SPEED LATHES
2067 READING ROAD . . . CINCINNATI 2, OHIO

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

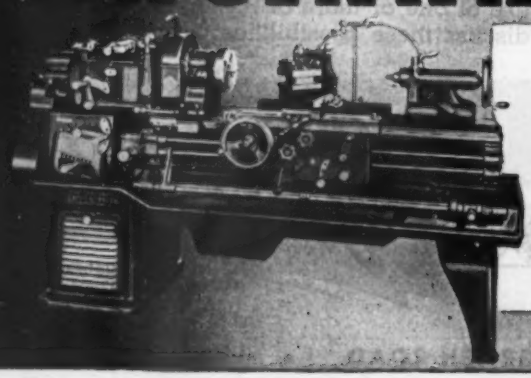
Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

CINNATI LATHES



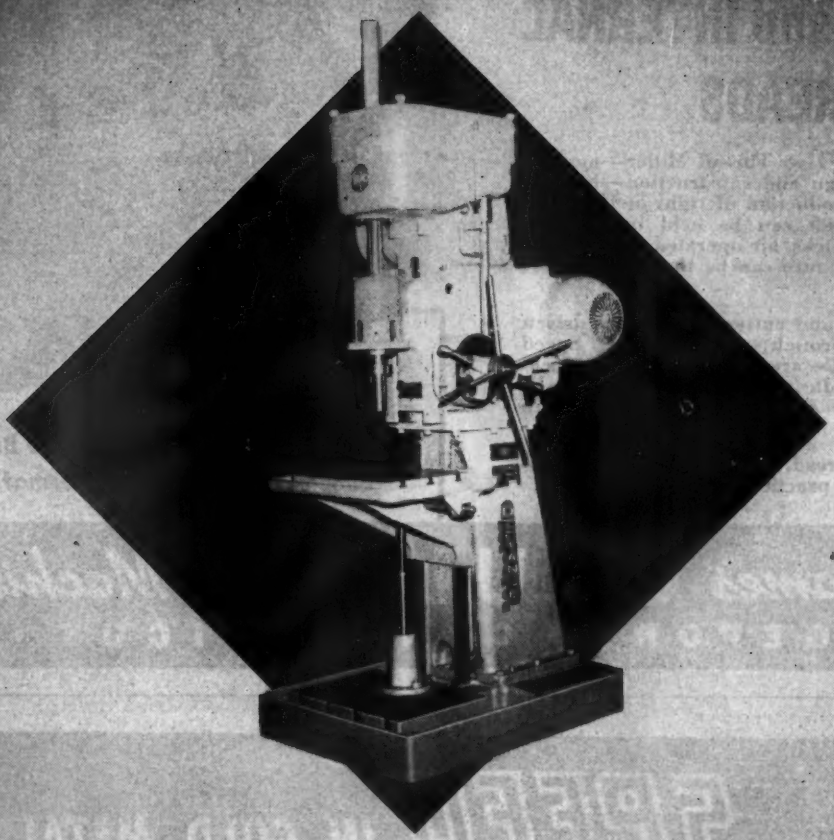
for FASTER, BETTER AND MORE PRODUCTION

To handle your most exacting jobs on Cincinnati Lathes is to be certain that you are set-up for speed, precision and low-cost production.

Send us your blue prints and let us work with you in handling your problems. Cincinnati Lathes produced in sizes from 14" to 30"—designed to meet your specific needs. It pays to investigate.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road Oakley SPECIALISTS SINCE 1906 Cincinnati Oh

PRODUCTION DRILL



● Defiance Production Drilling Machines are built with an extra measure of ruggedness and dependability. Anti-friction bearings on spindle and all speed shafts... alloy steel spindles and gears... wide choice of feeds and speeds... quickly adaptable to changes in production when necessity arises. Standard machine is equipped to receive multiple spindle heads. Capacities of high speed drill in steel include 1½" and 2".

Specify Defiance Machines for unbeatable accuracy, long life and low-cost operation. Write for latest Bulletin.

Defiance Machine Works, Inc., Defiance, Ohio.

ARMY ★ E ★ NAVY

DEFIANCE

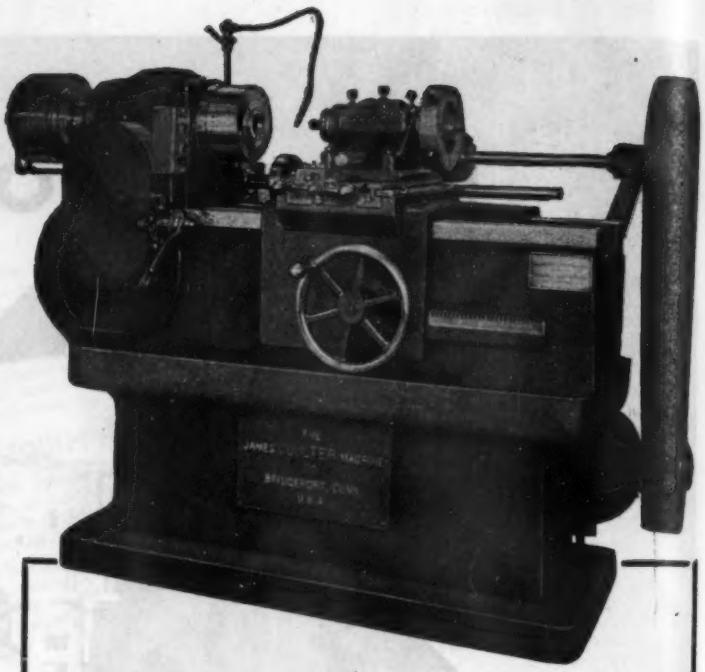
BUILDERS OF PRECISION MACHINERY SINCE 1850

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.

SPEED IN COLD METAL SAWING

The PORTER - McLEOD IS DESIGNED FOR HIGH SPEED COLD METAL SAWING

Straight, clean cuts on a truly high production basis are assured by the 8" Porter-McLeod. It is a compact, sturdy, amply powered unit designed for handling general or production work with utmost operating convenience and control. Economical quantities of bars or shapes can be "nested" and held rigidly during cutting by means of supports provided on sides and bottom combined with clamping pressure at top.

In the Porter-McLeod, the blade is supported for accurate cutting and for protection against damage. Adjustment is also provided for changes in blade thickness. Feed of blade is upward to stock with provision made to prevent weaving and buckling. Standard feeds up to 3" per minute are available. Protection against blade breakage due to hard spots in stock is provided by a friction feed disc.

This machine will handle either 8" round or 7½" square stock or the equivalent in "nested" work.

Investigate the high production possibilities of this machine by sending for descriptive Bulletin.

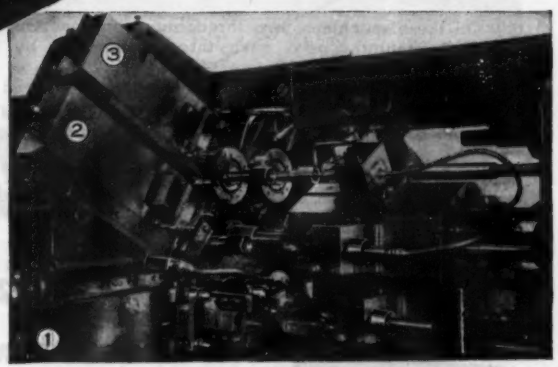
MACHINE TOOL COMPANY

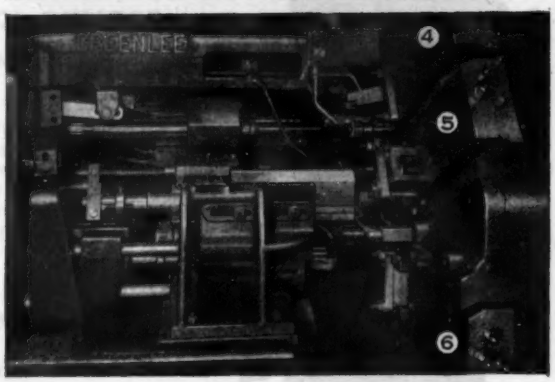
PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASSACHUSETTS, U.S.A.

INCENDIARY BOMB NOSE COMPLETED On 2" Greenlee 6-Spindle Automatics

BATAVIA METAL PRODUCTS CO. HAS STREAMLINED SET-UP

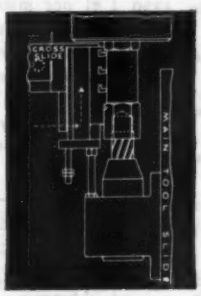
An up-to-the-minute screw machine department, complete in itself . . . inspection booth, tool room, packaging and shipping space, neatly arranged around a battery of 10 Greenlee 6-Spindle Automatics. . . saves time and speeds production of vital war parts at Batavia Metal Products Company, Batavia, Illinois. A unique inspection system, with red stop lights for each machine, affords quick control over operations. A conveyor belt, installed in front of machine line, transfers completed parts to inspection booth at rear. The Greenlees, of 2" capacity, *complete* the chemical warfare bomb nose part in fourteen operations from 1-21/32" S.A.E. X-1113 hex. stock at gross rate of 39 seconds per piece.





FORM-TURNING ATTACHMENT SIMPLIFIES PROCESSING

Greenlee form-turning attachment avoids wide plunge cutting of stock. As illustrated, cross-slide feeds narrow tools to depth. Main tool-slide then contacts attachment, turning a uniform diameter lengthwise on piece. This Greenlee feature, also offers unusual production advantages on many other parts — may be used in five positions. *Write today for more facts on Greenlee Automatics.*



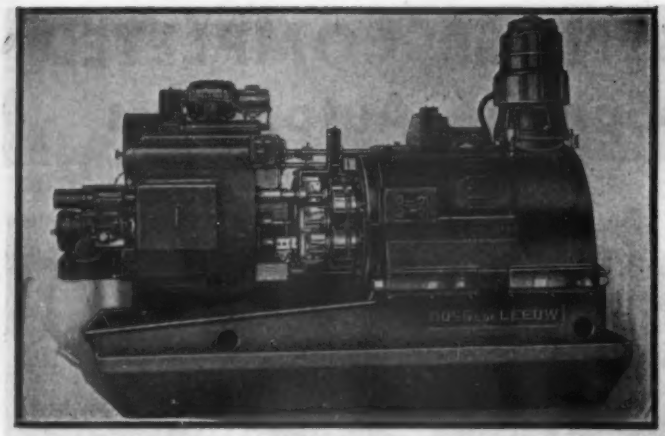
TOOLING DATA — Photos above show tooling set-up used to produce chemical warfare incendiary bomb nose. Operations are outlined below:

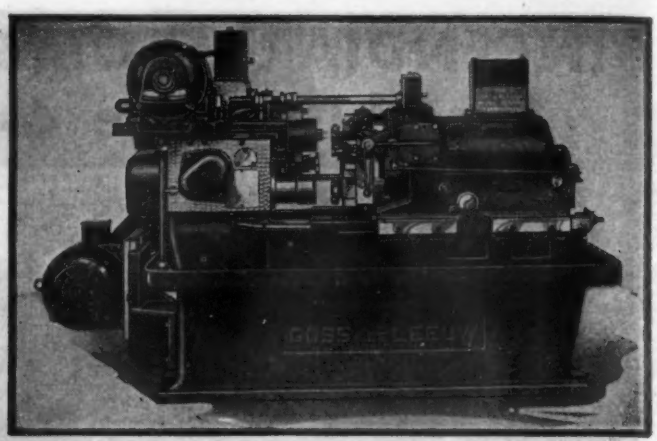
1. Form-turn hex. Drill 1" hole and counterbore for 1¼" tap.
2. Rough form small O. D. Finish drill 1" hole and chamfer.
3. Finish form large O. D. Drill small hole — partial depth.
4. Finish form small O. D. and face to length. Finish drill small hole with high speed attachment.
5. Groove outer diameters. Ream holes with geared reaming attachment.
6. Tap. Cut-off.

GREENLEE BROS. & CO. 1740 Mason Ave., Rockford, Illinois

GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

BUY THIS PACKAGE OF *Speed*

FOR RECONVERSION TOOLING JOBS

. . . a neat, compact Milling and Jig Boring machine, designed especially for small toolroom jobs such as dies, jigs, models, metal patterns, drilling, reaming, etc. The LINLEY saves larger machines for their rated capacities . . . does accurate, fast work . . . keeps the decks cleared.

Features:

- 8 speeds, from 275 to 4250 r.p.m.
- Direct micrometer measuring device.
- Backlash of quill travel eliminated.
- Grease-sealed bearings — no adjustment.
- Ample table size . . . 7 x 17½"
- Small floor space . . . 18½" x 20"

The quick set-up and easy changeover are reflected in generous profits, time saving and more production from valuable toolmakers.

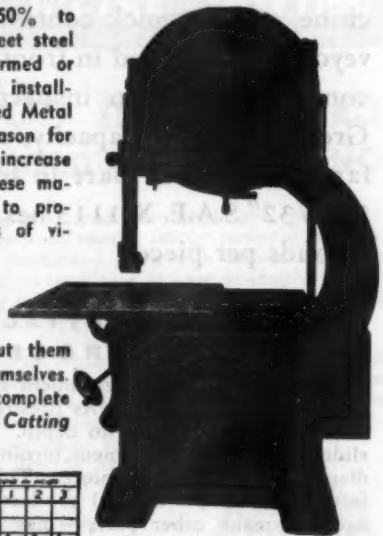
BULLETIN with all details ON REQUEST.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

SAW IT • • *IT'S FASTER!*

WITH *Tannewitz* METAL CUTTING BAND SAWS

Production increases of 50% to 100% in the cutting of sheet steel and non-ferrous metals—formed or flat—is the usual result of installing TANNEWITZ High Speed Metal Cutting Band Saws. The reason for this phenomenal production increase is due to the fact that these machines are precision built to provide better than two miles of vibrationless sawblade travel per minute and hence slide through the work with the greatest of ease. Many patented features put them entirely in a class by themselves. It'll pay you to get the complete facts. *Just ask for Metal Cutting Band Saw bulletin.*

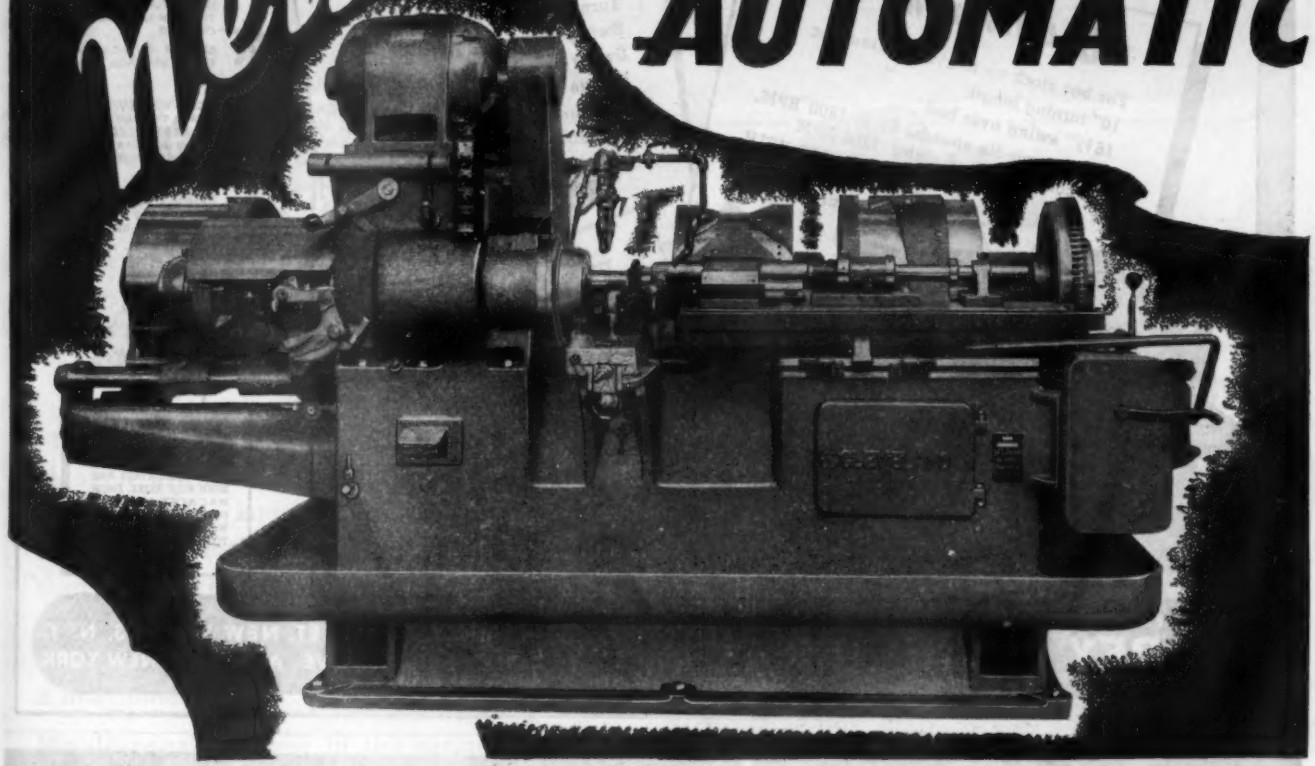


KIND OF MATERIAL	Feet per minute (over) (under) rate, based on weight							
	1/32	1/16	1/8	1/4	1/2	1	2	3
Mild Steel	32-24	6	3	1				
Stainless Steel	8	2	1	.				
Yellow Brass, Zinc	24	12	6	3	1½	½	¼	⅛
Bronze or Copper	6	3	1½	¾	⅜	⅛		
Aluminum	32-24	10	5	4½	2	1½	1	½
Duralumin	24	12	6	3	1½	1	½	¼
Single Fiber				6	4			
Double Fiber				4	3			
Plywood	32-24	24	20	16	12	6	3	1½
Asbestos Board	12	6	3	1½	¾			
Fibre (Hard)	24	12	6	3				
Paper Board	24	10	12	4	2	½		
Masonite	24	10	12	6	3	1½	½	¼
Bakelite	12	6	3	1½	¾	⅜	⅛	

Other bulletins worth writing for: "SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE"; "BAND SAWS FOR DIE-SAWING"; "INSIDE AND OUTSIDE FILING AND POLISHING".

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH

There's a New CLEVELAND AUTOMATIC



MODEL B
3 3/4" and 5 3/4"

FOR THAT TOUGH JOB of making high basic costs, plus high production quantities, plus high structural quality fit increasingly competitive prices. The new Cleveland applies greater efficiency in production (only solution to this problem) to processing a wide range of bar or tube stock into finished pieces up to 5 3/4" diameter . . . Forming and turning multiple O.D. plus one end working position.

Also ideal for second operations, with "automatic loading" to speed output. Not a postwar dream, but an efficient and productive adaptation of work-tested features from the broad line of Cleveland Automatics with capacities from 9/16" to 10". *Write for our descriptive Bulletin.*

Remember... Clevelands Cut Costs

CHICAGO (6):
1408 Civic Opera Building
DETROIT (2):
540 New Center Building
NEWARK (4):
902 American Insurance Bldg.
CINCINNATI (12):
4932 Beech Street
HARTFORD (1):
529 Capitol National Bank Bldg.

THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND 3, OHIO

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

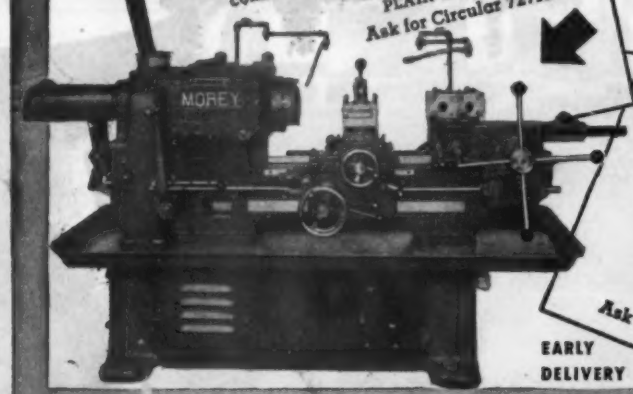
2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 8½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

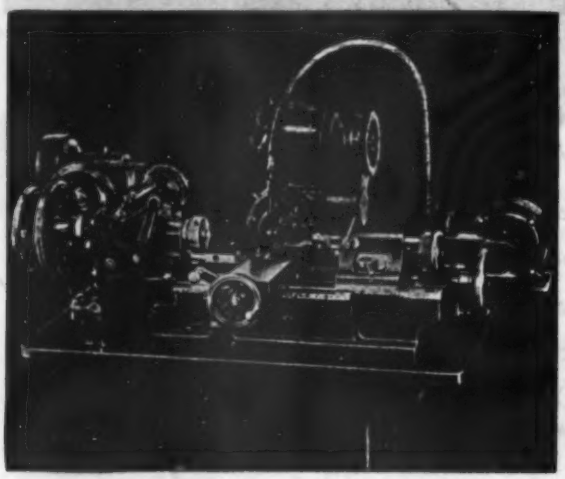


- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY NAVY

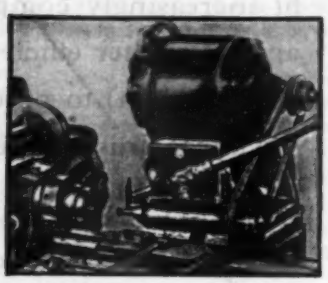
THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

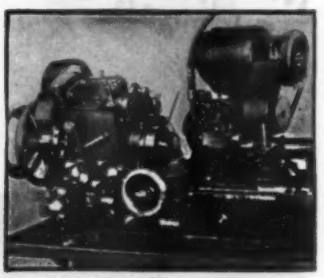


WALTHAM THREAD MILLERS

for fast, versatile and convenient production of precision threads



Internal Thread Milling Attachment applied to machine.



Machine with Relieving Equipment.

All standard forms of threads can be produced accurately and easily on these improved machines. Cutters for threads required are available from Waltham. Three motors on these machines (for speed, feed and oil) permit great flexibility in operation as well as an assured supply of coolant at all times. Motors are wired so that all can be controlled at one time from a single start and stop station.

Send for descriptive literature and detailed specifications.

SPECIAL EQUIPMENT

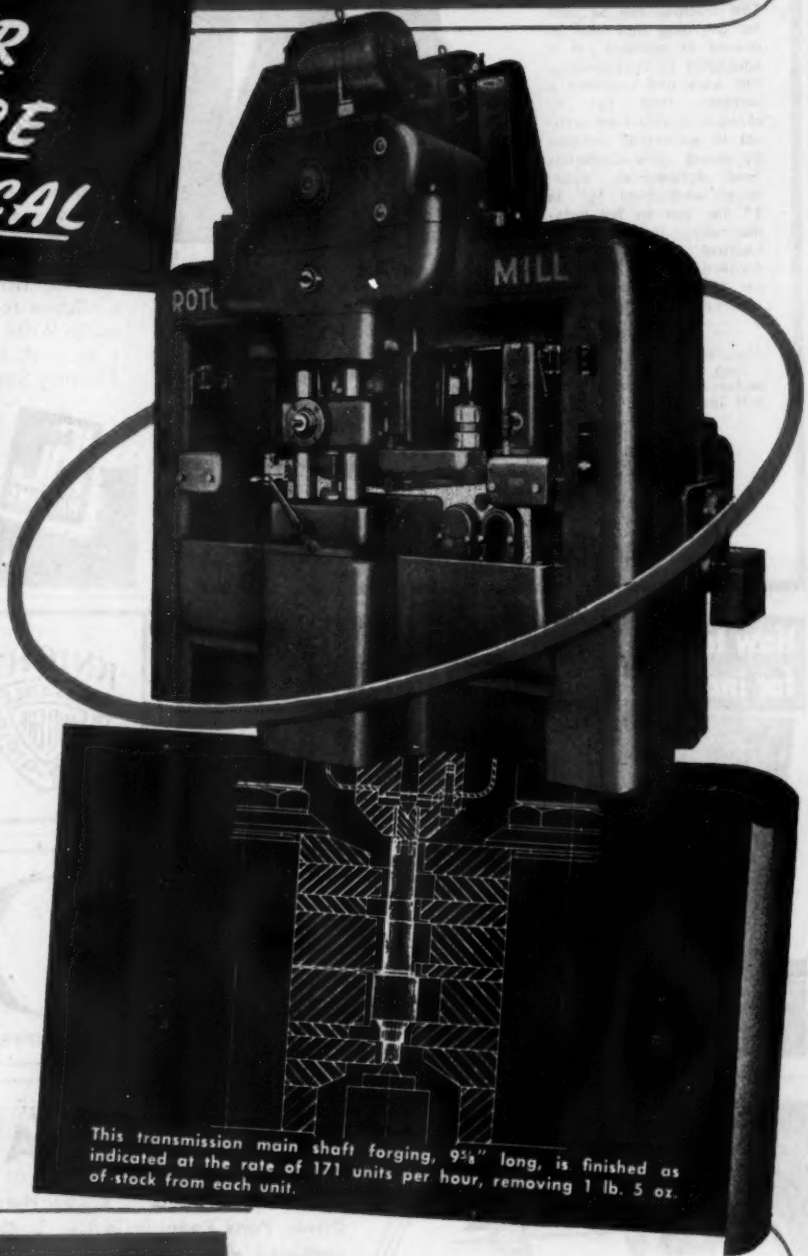
The utility of these machines is greatly extended by extra equipment available, which includes: a special work head for relieving; a special motor driven cutter head for internal threading; a multiple cutter threading attachment; automatic cam operation; special tail stock; translating gears for cutting metric threads; metric lead screw; taper attachment.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM

Use the ROTOMILL
...INSTEAD OF THE LATHE

It's FASTER and MORE ECONOMICAL



Machining cylindrical, conical or flanged work such as gear blanks, shafts, steering knuckles, etc. can be done more effectively on the RotoMill than it can on the lathe. A tolerance of .004" in diameter is normally maintained thus eliminating in many cases a final finishing cut.

Metallurgical changes in the surface metal of the work part due to cold working do not occur because there is very little rise in temperature during the cutting operation. For the same reason cutter life is surprisingly long.

A cutter change, when cutters are kept in sets mounted on solid arbors, can be made in about fifteen minutes. Thus the RotoMill is just as effective on short runs as it is on long production jobs.

WRITE
FOR DESCRIPTIVE BULLETIN

This transmission main shaft forging, 9⅝" long, is finished as indicated at the rate of 171 units per hour, removing 1 lb. 5 oz. of stock from each unit.

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN • DETROIT 13, MICH.

Specialists on SPUR AND HELICAL INVOLUTE GEAR PRACTICE

Originators of ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

"PRODUCTION" Type S Centerless Polishing and Finishing Machine

No Skilled Labor Required

This machine can be used for anything that can be ground or polished. It is adaptable to cylindrical or flat work and combines a machine that can be changed quickly from vertical to horizontal position. By means of a Centerless Feed Attachment, cylindrical work from ⅛" to 1" dia. can be fed automatically; flat and cylindrical work may be finished by easy hand manipulation. Equipped with adjustable gauge for bevels, tracking device for tracking belt and automatic belt take-up for stretch.

SPECIFICATIONS

Abrasive belt—4" wide, 60 in. long
Motor—1 HP, 1750 RPM
Belt Speed—3200 ft. per min.
Dist. table to floor—(horizontal position)—36"
Table—4½" x 13½"
Ball bearing equipped

Write for illustrated folder giving full details.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

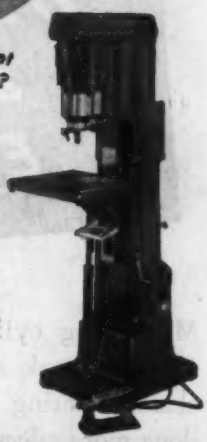
GREENFIELD, MASS., U. S. A.

Your Tapping Questions

When should I use a two-flute tap?
What is meant by per cent of thread?
Is the type of cutting oil important?
How much chip clearance should I allow in a blind hole?
Which holding fixture?
How can I get more tap life?

Answered

Precision tapping is a science in itself, and even an experienced operator will occasionally run into a snag. Our engineers are trained in the field. Draw on their experience and knowledge to reach a solution to your problem quickly and easily. Write for catalog. Send your questions to R. G. Haskins Co., 2761 West Flournoy Street, Chicago, Illinois.



HASKINS **haskins**

PRECISION TAPPING EQUIPMENT

How to apply the HORIZONTAL ROTO-MATIC for increased Drilling Production is described

in this

FREE BOOKLET

Learn how the Roto-Matic principle of continuous operation can be applied to your drilling, boring, reaming, facing, milling, etc., requirements and result in increased production. Write today for this booklet describing the many adaptations and advantages of the Roto-Matic. Ask for Bulletin No. A-110.

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

6411 W. Burnham St. • Milwaukee 14, Wisconsin

KNIGHT — VERSATILE MILLERS — ACCURATE - RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.

ST. LOUIS MISSOURI

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

Cleans quickly— SAVES 60%

SUN SPIRITS

Cuts metal cleaning costs 60% . . . quickly removes oily film

In a plant manufacturing machine parts, production-hampering delays were found to be the direct result of their metal cleaning operations.

Oily film remained on parts. The metal cleaner in use did not clean thoroughly.

A Sun Engineer, called in on the problem, advised that with Sun Spirits, not only could troublesome delays be eliminated, but considerable savings were possible.

A switch to Sun Spirits proved his statement. Now, oily residue is dislodged quickly and thoroughly. The minute pores of the metal are penetrated . . . parts are sparkling clean. Time is saved, too, because Sun Spirits requires no mixing or heating.

A 60% saving in costs was also effected by the change . . . and no complaints have been received from the operators.

This is typical of the excellent performance Sun Spirits is giving today, in many plants. It can help you attain the same efficiency, and economy in your plant. For more details, write for your free copy of "Case Histories of Cleaning Up War Parts."

SUN OIL COMPANY • Philadelphia 3, Pa.

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

SUNOCO

SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

Don't let

ONE LONE GRINDER

upset Production Schedules

GET MORE WORK-HOURS with a battery of Lo-Cost

QUEEN CITY GRINDERS

Stop production losses and wasted time caused by "ganging up" on one lone grinder. Make every man, machine and minute count . . . install several Lo-Cost Queen City Grinders in spots handy to workers.

Leading firms find that batteries of rugged, dependable Queen City Grinders quickly pay for themselves in hundreds of work-hours saved. Write today for full details.

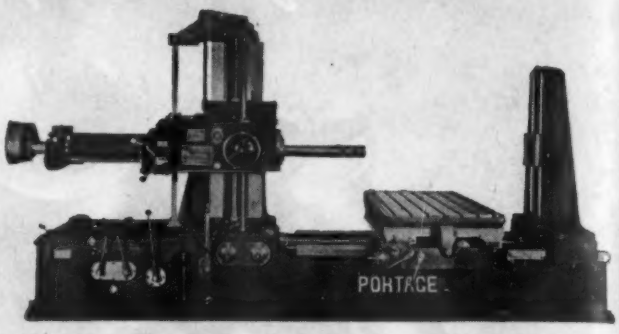
Agents in principal cities

(Illustrated) Model 3-F, 1 H.P. Queen City Heavy Duty Grinder. Induction-type motor, 1750 rpm. 2—10" dia., 1¼" Carborundum wheels, one coarse, one fine. Complete safety equipment. 51" high, base 20" x 15". Spindle dia. ⅞". Tool rests, accurate and adjustable.

Send for NEW CATALOG
Gives complete details and prices

QUEEN CITY MACHINE TOOL CO.
217 E. SECOND ST. CINCINNATI 2, OHIO

PORTAGE



NO. 4 HORIZONTAL BORING DRILLING & MILLING MACHINE

• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

WRITE for full descriptive bulletin today.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF
CLEVELAND
OHIO, U. S. A.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Conversion Job... from BORING to MILLING

and at a substantial saving in machine cost

This Snyder two-way machine originally was designed and built for a medium boring operation on an ordnance part. When that particular contract was completed, the machine was turned over to Snyder for conversion to a milling operation on another ordnance part.

The conversion process utilized most of the original machine including base and units. Two single-spindle heads were mounted on each end, these being hydraulically operated and electrically controlled by push button.

Besides the considerable saving in time, there accrued also a saving of approximately 50% as compared to the cost of a new machine.

Many machines now operating on war contracts are similarly convertible and offer comparable opportunities for savings in time and money. The time-saving feature will be particularly important when the objective is to reach markets with civilian goods as quickly as possible.

Anticipating the day when war contract machines will become available for conversion to peacetime production, we suggest that you get in touch with us now with the idea of discussing your machine conversion problems and objectives and—as a farsighted precaution—possibly making a reservation for the engineering and plant facilities which will be required for your conversion work.

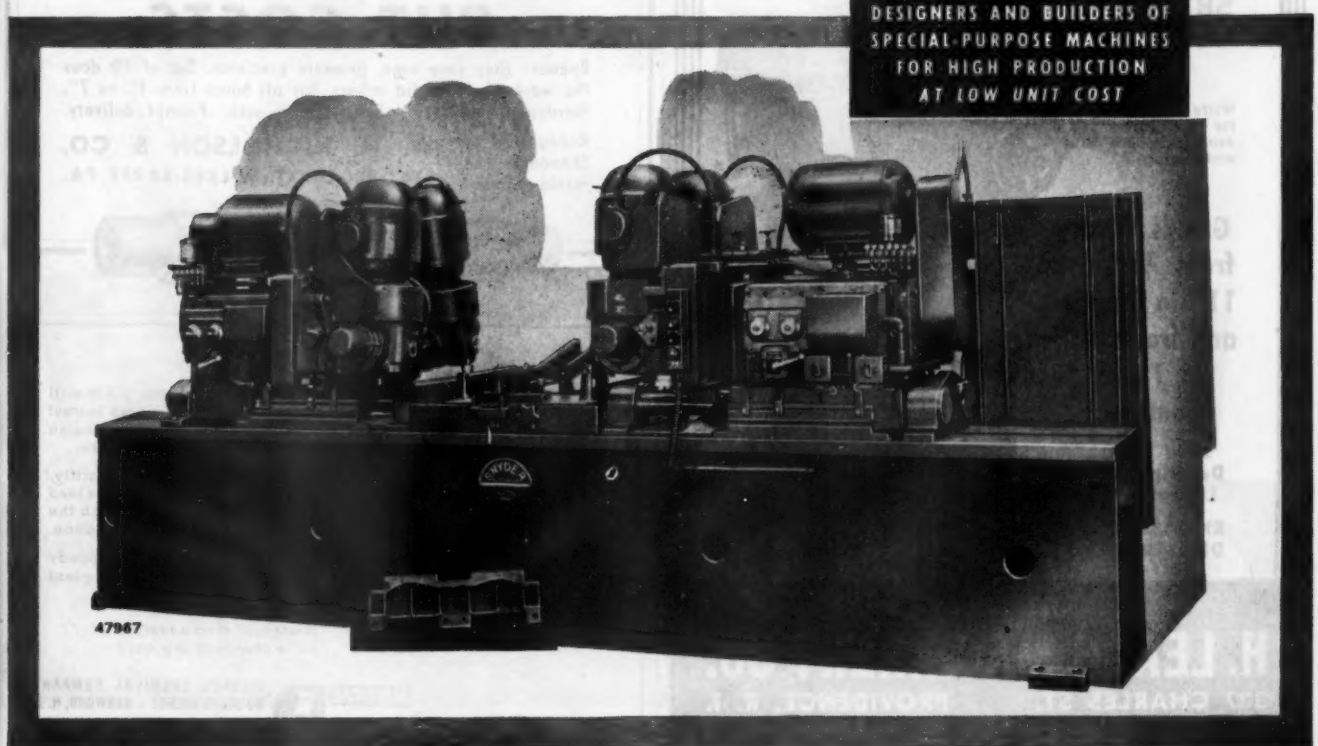
We invite you to write us in full confidence. *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Mich.*

PLAN Your PRODUCTION when you PLAN Your PRODUCT

20 Years of Successful Co-operation with Leading American Industries

SNYDER

DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST

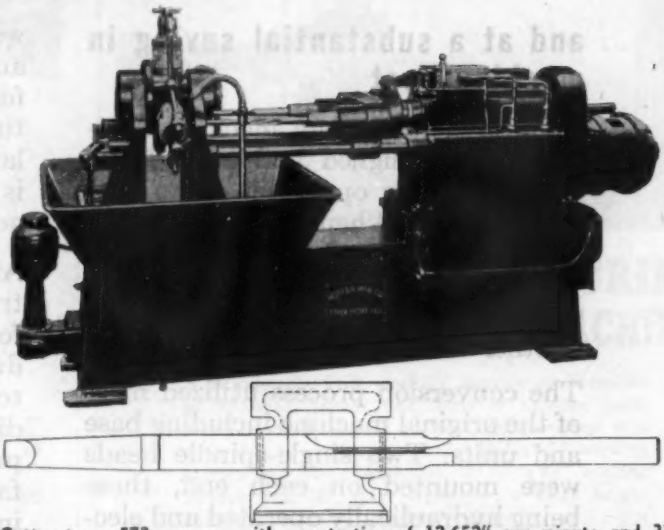


PILOTED CUTTING TOOLS BORE AND REAM DIE CASTINGS

★ This single end Hoefer Machine has a 5 h. p. unit on which is mounted 2 spindle heads tied to a 3-station index fixture by guide bars. It bores and reams cored pin holes in die cast pistons. Tools are piloted both front and rear.

Machine is equipped with coolant pump all controlled from central electrical control. Hydraulic feed of unit is automatically started when index plunger fully enters the index bushing on trunnion.

Hoefer Hydraulic Feed Units plus Hoefer Multiple Spindle Heads offer an economical solution to production drilling problems. Investigate the advantages of this equipment as concerns your present and post war production.



Cutter turns 573 r. p. m. with penetration of 12,652" per minute and 3½" total travel. Time required is 15½ seconds if feed moves full length at .024" per revolution. Requires only 9 seconds if reamer travels through the two ⅞" bosses and jumps center gap of 1¾". This can be done with an adjustable jump mechanism furnished as an extra.

Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

LEACH External Grinder

PRICE
$875.00
Fully Equipped

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

Send for Descriptive Literature

EXCELLENT DELIVERIES

Exclusive Selling Agents

H. LEACH MACHINERY CO.

337 CHARLES ST. PROVIDENCE, R. I.

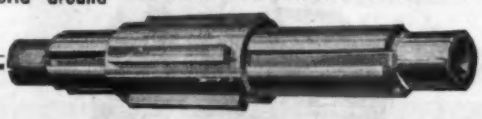
Agents in all Principal Cities Throughout the World

NICHOLSON EXPANDING MANDRELS CUT COSTS

Because they save time, promote precision. Set of 19 does the work of 193 solid arbors, for all bores from 1" to 7". Hardened tool steel. Singly or in sets. Prompt delivery.

Recognized as Standard the world around

W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.



"I'LL PUT MY COAT ON MYSELF UNTIL YOU USE MAGNUS HAND CLEANER"

The men (and women) in the plant will use the hand cleaner that works fastest and with the least scrubbing. If it's harsh and harmful, they don't know or care.

But you should care, because cheap, gritty, strongly alkaline or solvent cleaners lead to infections and dermatoses that rob the plant of too many man-hours of production.

Magnus Hand Cleaner is safe, speedy and economical. It belongs in your plant washrooms.

Want us to send a sample for a thorough try out?

Magnus
MAGNUS CHEMICAL COMPANY
60 SOUTH AVENUE - GARWOOD, N. J.
INDUSTRIAL CLEANERS

Need more manpower?

How to find it in your own plant

TODAY, although it is almost impossible to get more workers, it is often possible to get more *output* by selecting machines better suited to the tasks they perform.

Many manufacturers have substantially increased production by adopting compact, fast Walker-Turner Machine Tools in place of larger, more expensive units. Study the descriptions of the machine tools shown here and consider the possibility of speeding up output on operations within their capacities. Then send for catalog.

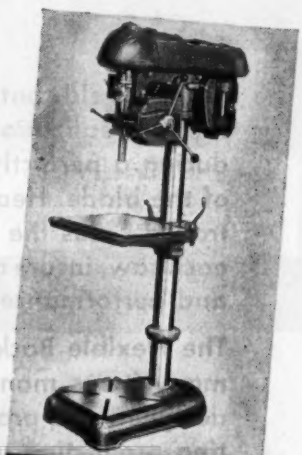
WALKER-TURNER COMPANY, INC.
4524 Berckman Street Plainfield, N. J.

RADIAL DRILL
Handles light drilling, tapping operations effectively. Drills to center of 62" circle. Spindle speeds 160 to 8200 r.p.m.

METAL-CUTTING BAND SAWS
14" and 16" models. Speed range from 61 to 5300 s.f.m. for cutting practically any material from steel to wood.

POLISHING LATHE
For burring, polishing and hand-lapping operations.

METAL CUT-OFF MACHINE
Ball bearing sliding ram travels 21½". Cuts all types of materials at any angle.



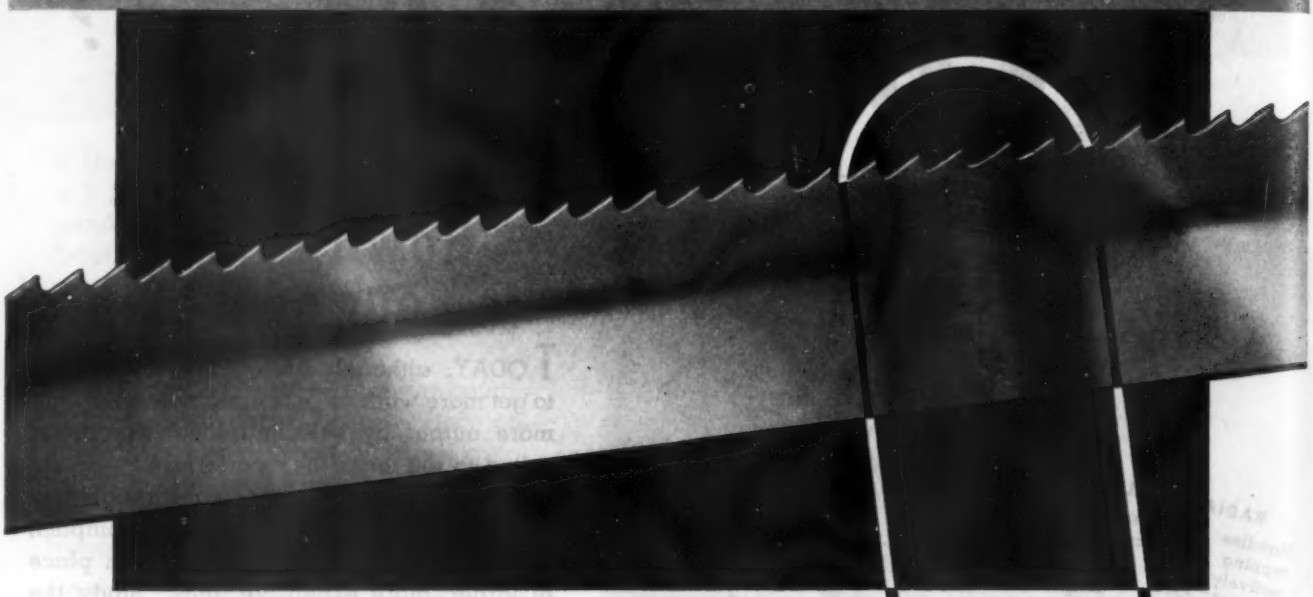
15" AND 20" DRILL PRESSES
Bench and floor models available with or without power feed.

walker-turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

THERE'S A *Barnes* SAW FOR EVERY BAND SAW OPERATION



In a **BARNES BAND SAW**

You Can Always Be Sure Of

A STRONG UNIFORM WELD

It's the weld that distinguishes Barnes Flexible Back Band Saws from ordinary saws. With the full realization that a saw is no stronger than its weld, Barnes spares no efforts in producing a perfectly aligned and uniform weld that will prove as strong as any other area of the blade. Heat treating and tempering processes—in modern furnaces, electrically controlled—plus the rigid testing and inspection of each saw, insure a product of outstanding quality and performance.

The Flexible Back Band Saw is only one of the many items manufactured by Barnes . . . each designed and produced for maximum metal cutting production and efficiency.

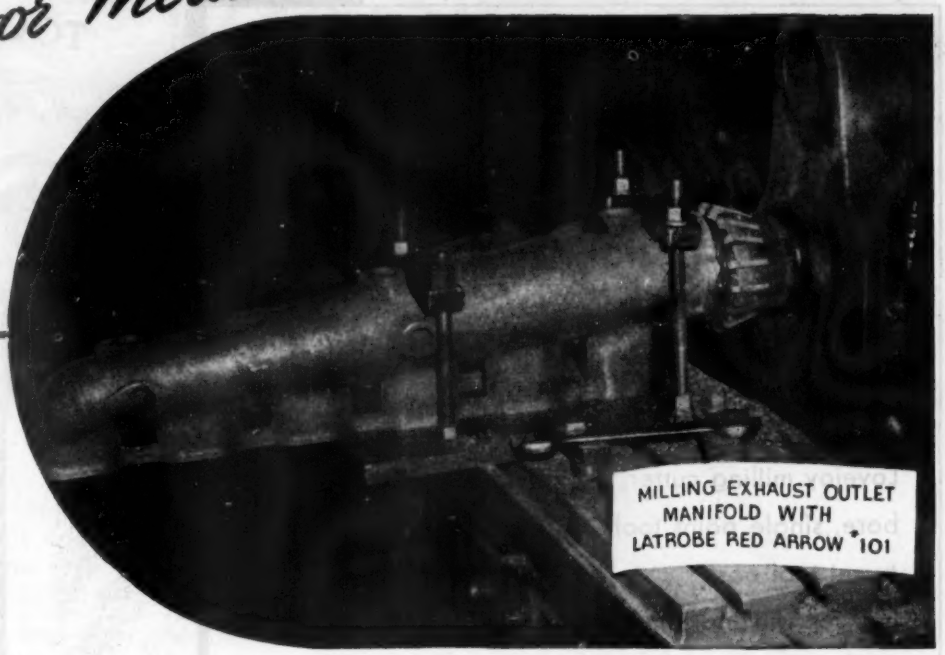
CALL YOUR BARNES DISTRIBUTOR, who will gladly give you fullest information. To help you solve any special sawing problem, the services of a Barnes factory-trained engineer are at your disposal.

W. O. BARNES CO., INC. 1919 - 1944

DETROIT 14, MICHIGAN ○ TWENTY-FIFTH ANNIVERSARY ○

Have you tried LATROBE RED ARROW

—The Superior Cast Alloy for Metal Cutting Tools



Requires no heat treatment

Easily brazed to tool body

Ground with ordinary wheels

MANUFACTURERS OF SMALL TOOLS

Latrobe Red Arrow is available in the "as cast" state for grinding to the dimensions of the finished tool.

LATROBE RED ARROW Cast Alloy Cutting Tools operate most efficiently in that "intermediate cutting range" between high speed steel and tungsten carbide. Cutting tools cast from these alloys make important savings possible—***more pieces per grind, higher speeds and feeds, better surface finish!***

Standard sizes of Tool Bits carried in warehouse stocks.

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT · LATROBE · PENNSYLVANIA

ONE OF THESE IS YOURS FOR THE ASKING!!

The new Lovejoy Tool Catalog has met with an immediate favorable response, because in it is included all data needed for ordering any type of Lovejoy milling cutter, boring head, arbor, counterbore, single point tool, boring and facing bar, and turret tool post.

In it you will find complete descriptions, line drawings, prices, engineering data, hints on grinding, speeds and feeds. etc.

Fill in the coupon today for your free copy.

MAIL THE COUPON TODAY!

Please send me my free copy of "Lovejoy Modern Metal Cutting Tools."

NAME_____ TITLE_____

COMPANY _____

STREET _____

CITY_____ STATE_____

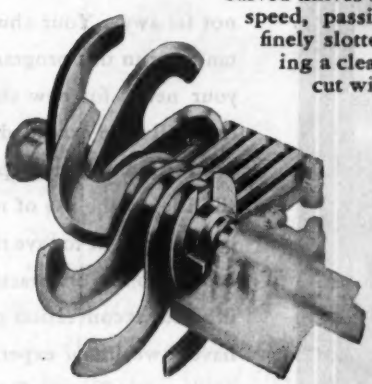
A. M.

Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

READY FOR MESS CALL

with minutes to spare

When cutting food the Disston curved knives revolve at high speed, passing through a finely slotted comb, making a clean, sheer, draw cut without mashing or squeezing.



Army and Navy chefs know the full meaning of the words, "on time," for they have the tremendous job of preparing three meals a day for several million men! Only with the help of modern mechanical aids is such a gigantic task possible.

In camp kitchens and ship galleys throughout the world—in civil life too—ingenious meat and vegetable cutting machines, equipped with keen-edged Disston knives, are speeding-up meal preparation, reducing costs, and conserving manpower.

This Disston knife, made of one piece of steel, is hardened along the cutting edge only. The remainder of the knife is of comparatively soft steel and, being free from strains and stresses, it does not bend in operation or cause jamming in the comb plates.

Disston engineers are being constantly called upon to provide tools for war and other jobs. Because of Disston experience in producing a wide range of standard tools these engineers have been able to solve some of the toughest problems that came out of the war.

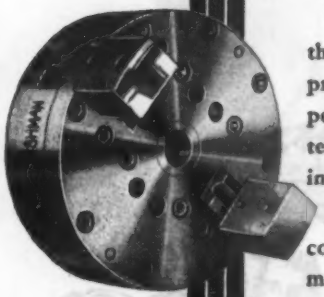
When you need wood or metal cutting saws, files, hack saw blades, tool bits or machine knives, you can rely fully on those bearing the honored name of Disston. Write to Henry Disston & Sons, Inc., 1120 Tacony, Philadelphia 35, Pa., U. S. A.

ESTABLISHED 1840
*REG. U.S. PAT. OFF.

DISSTON

Conserve Man-Minutes and help win the war

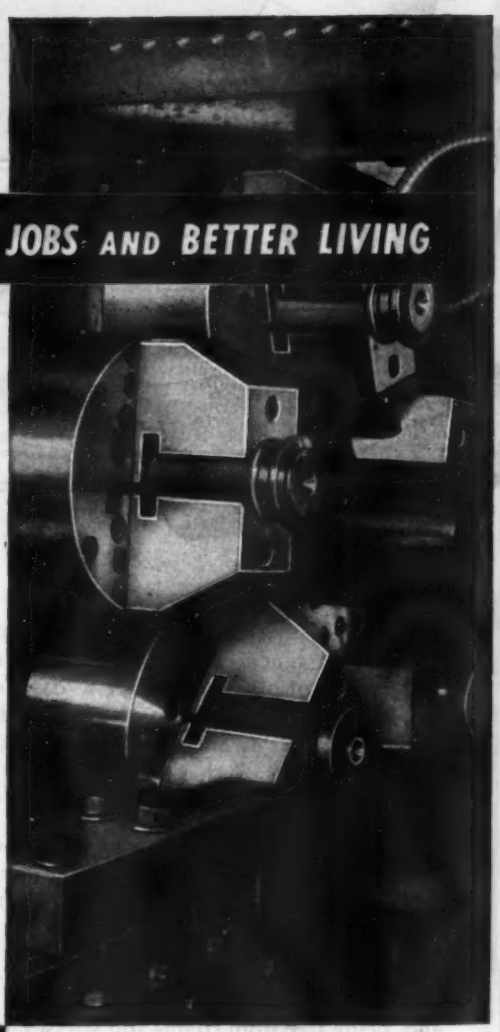
Today **THE KEYS TO VICTORY ARE BEING FASHIONED IN THE ACCURATE JAWS OF CUSHMAN CHUCKS**



We say this, not in a spirit of claiming more than our small share in contribution to war production, but to again emphasize the importance of conserving, through efficient maintenance, every hour of productive service built into the chucks on your machine tools.

Eliminate time losses and work spoilage by constant check on your work-holding equipment. Select the right chuck for the job. Insist on proper lubrication . . . correct use . . . regular inspection for sustained accuracy . . . prompt repair or replacement when necessary. A supply of our "Chuck Check" cards . . . sent free on request . . . will help you. Write us.

Tomorrow ***. . . THE KEYS TO BETTER JOBS AND BETTER LIVING***



Reconversion is . . . we sincerely hope . . . not far away. Your chucks can play an important part in this program. By outlining NOW your needs for new chucks to replace those that will have exceeded their useful life in war production . . . by exploring the many possibilities in the use of new standard or special jaw equipment to save time in retooling . . . you can take one more practical step toward speeding your reconversion plans. We, at Cushman, have a wealth of experience we are ready and anxious to offer you. Our expanded engineering department facilities are available now to aid you in your planning. Write us.

The Cushman Chuck Co.,
Hartford 1, Conn.

CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

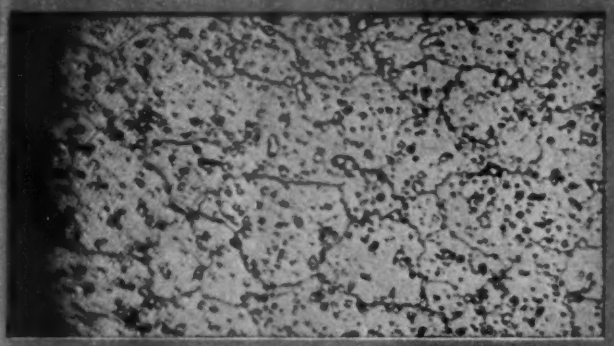


Figure 1—750X—Edge structure of Tungsten-Molybdenum type high speed steel treated in Park No. 175 High Heat Salt for seven minutes at 2200° F. Note absence of decarburization in the "as quenched" structure.

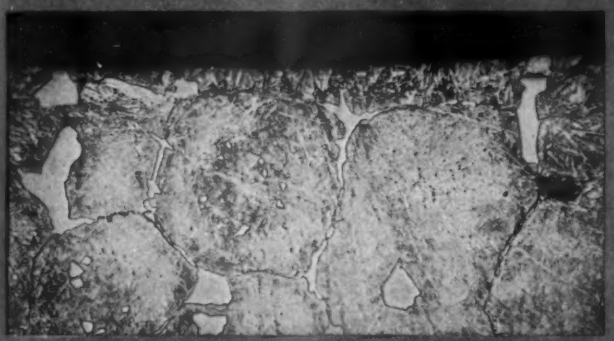


Figure 2—500X—(Reduced in printing.)—Edge structure of a high speed steel tool after several hours immersion in a Park No. 175 High Heat salt bath. Note large grain size, carbide distribution, and absence of decarburization.

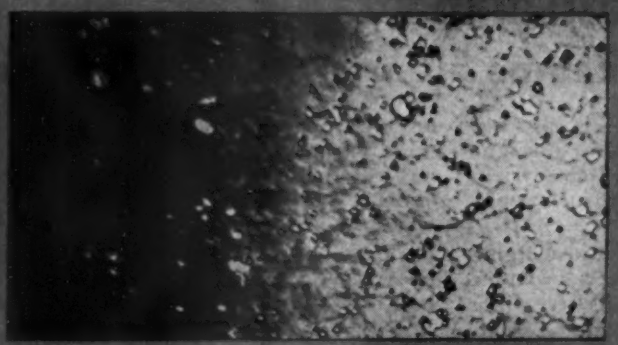


Figure 3—750X—Edge structure of a hardened and drawn high speed steel tool after treatment in Park No. 90 Casing Salt. Note the dark etching nitride "case" which is responsible for the improved cutting ability and longer life shown by tools receiving this treatment.

It's the *cutting edge* that counts!

NO OXIDATION, decarburization or pitting occur when high speed tools are heat treated in Park salt baths.

Park High Speed Salt Baths are formulated to provide easily maintained neutrality. They are balanced to minimize the effect of carry-over and facilitate cleaning.

Park

HIGH SPEED SALT BATHS

No. 117 High Speed Steel Preheat Salt
No. 175 High Speed Steel Hi-Heat Salt
No. 100 High Speed Steel Quenching Salt
High Speed Steel Drawing Salt
No. 90 High Speed Steel Casing Salt

• • •

There is a Park Service Engineer in your territory who will be pleased to assist you in realizing the maximum benefits of Salt Bath heat treatment. Write today for the address of the Park representative nearest you.

Park
PARK CHEMICAL CO.
8074 MILITARY AVENUE

SPECIALISTS IN HEAT TREATING SINCE 1911

Liquid and Solid Carburizers—Cyanide, Neutral and High Speed Steel Salts—Lead Pot Carbon—Charcoal—Coke—No Carb—No-Kase—No-Tride—Carbon Preventer—Quenching and Tempering Oils—Drawing Salts—Metal Cleaners—Liquid Grain Cement.

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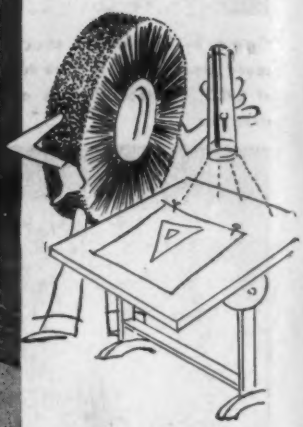

The brush that lights a draftsman's table . . .

AND MAKES THE RADIOS HE DESIGNS PLAY BETTER!

This is the Brush
(Actual Size)

THE ends of fluorescent tubing must be perfectly free of all frosting or foreign matter, so that the metal end which carries the charge will contact only the insulating glass.

A little, unseen fleck could cause light failure. Osborn brushing wheels provide light insurance for fluorescent lights by positively and uniformly removing *all* such matter from the tube terminals.

Brushing played an important part in providing these draftsmen with better lighting to work on plans—plans for products which also can be improved by power brushing.

For instance—radios. Here small gears should be cleaned thoroughly to provide hairline tuning. An Osborn fine wire brush is perfect for this job. For wire stripping on the coils and numerous connections there is another Osborn brush. Removing fins from plastic parts is still another operation best done by power brushing.

Brushing wheels as developed by Osborn, 50-year pioneer and leader in the field, have been proven under wartime stress—the best tools for surface finishing operations.

In planning your new products—whatever they are—*while they are still in the drafting stage*—it will pay you to consider the tremendous versatility of Osborn brushes for finishing surfaces . . . making your product perform better, look better, sell better—at a lower unit cost!

Investigate without obligation. Contact Osborn and an expert field engineer will make a study of your operation or plans and submit specific recommendations.

THE OSBORN MANUFACTURING COMPANY

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Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

MACKLIN GRINDING WHEELS.

"PROTECT YOUR PRODUCTION" with Macklin High Quality Wheels—made from the smallest to the largest—in all grains and grades, for every grinding purpose.

Ask for the services of a Macklin field engineer

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

YOU "PEP UP" PRODUCTION LINES

WHEN YOU ADOPT

SAFETY

GRINDING WHEELS

Other SAFETY Products Include—

- "Rite-Speed" Double End Stand Grinders
- Swing Frame Grinders
- Portable Grinders
- Floor Stand Grinders

When faced with tight war material schedules, when full production capacity is the order of the day, when production lines must be stepped up and kept moving . . . that's when SAFETY Grinding Wheels prove their class!

Because they're specifically engineered for the job they do, they are long-lived, grind fast, run cool, reduce rejections!

Unless yours is one of the scores of plants using SAFETY Grinding Wheels as standard equipment, it would pay you, we believe, to find out how they might also pep up *your* production lines, and give you greater output at lower unit cost.

Any one of the SAFETY offices are staffed and equipped to confer with you on a "brass tack" basis, to suggest one or more SAFETY Wheels for your trial, and to make prompt delivery of the ones you need for better grinding wheel performance. Get in touch with the one nearest you. Or write us direct!

Your inquiries are invited. No obligations!

SAFETY GRINDING WHEEL AND MACHINE COMPANY

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

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"Never saw anything like it"

IT'S THE
2-IN-1 WHEEL

2 TO 5 TIMES
LOWER GRINDING COSTS

search has established the practicability of using—for
ny jobs—the same Por-os-way wheel for rough grind-
as chosen for precision finishing. By taking advantage
this double duty you may also eliminate the "special"
ish wheel and save costly time wasted on wheel changes
d extra finishing operations. It's worth trying!

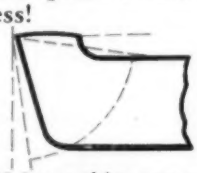
List of Por-os-way Users Reads Like a Blue Book of American Industry, Included are:

C. Atkins & Company • Bell Aircraft • Edward G. Budd
g. Co. • Buick Motor Division of General Motors • Kinner
tors, Inc. • Studebaker Corporation • Thompson Aircraft
ducts • Wadell Engineering Company • Westinghouse
Electric • Wright Aeronautical

• "When our Por-os-way trial wheel arrived, a number of our engineers asked themselves in on the test. We tried Por-os-way on high speed, oil hardened and many other steels. They were goggle-eyed at the heavy feeds Por-os-way took without burning and without great loss of abrasive. They'd never seen *anything* like Por-os-way's cutting action. And the way it cut costs!"

Be hard to convince. Be skeptical. But try Por-os-way . . . that's all we ask. Send for the Por-os-way booklet "Facts About Por-os-way"—with the prescription blank. Order a trial wheel and give it the business!

YOU'VE GOT TO HAVE CHIP CLEARANCE—

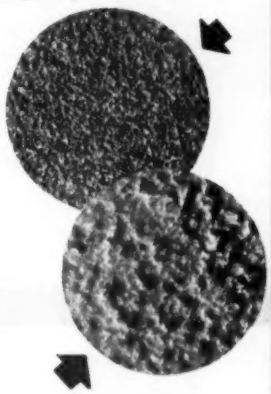


The tiny cutting edges of grinding wheels need chip clearance—as do shaper tools—to remove material without interference. The Por-os-way structure provides chip clearance NATURALLY. Long chips prove it! Chip clearance means much less dressing required.

THIS MAKES THE DIFFERENCE—

You can spot the difference between an ordinary wheel (top) and a Por-os-way wheel (bottom) with the naked eye. The extra porosity of Por-os-way is the reason for more than 8 distinct operating advantages.

The Wheel that Costs the Most at First— Costs the Least at Last



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A. P. de Sanno & Son, Inc.

RADIAC*

POR-OS-WAY*

A. P. DE SANNO & SON, INC., 430 Wheatland St., Phoenixville, Pa., Since 1893

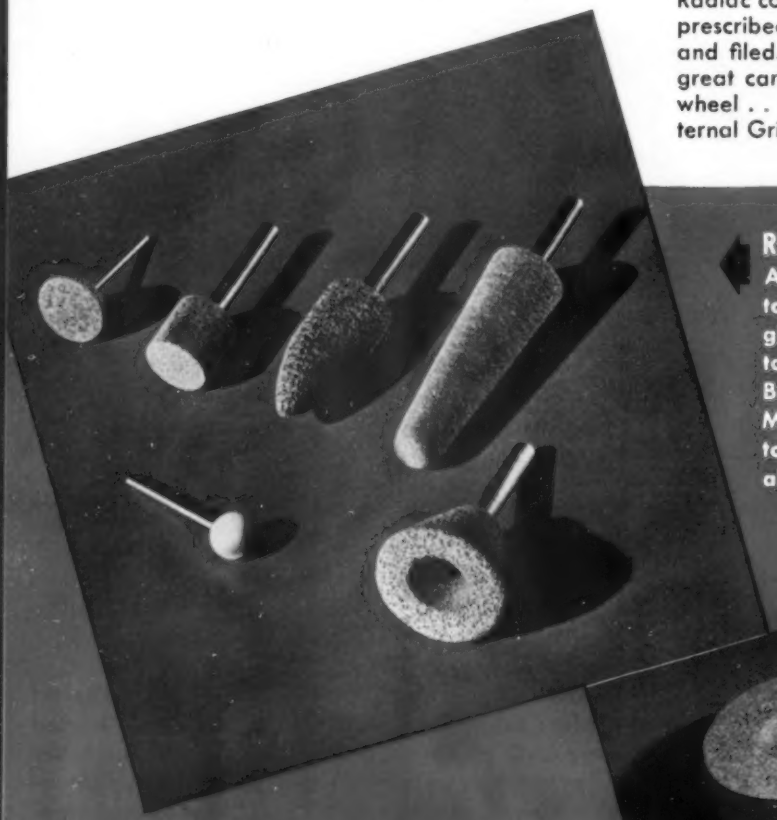
NEW YORK, PITTSBURGH, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

Radiac POR-OS-WAY • Radiac PARAFLEX • Radiac Mounted Points and Mounted Wheels
Radiac Internal Grinding Wheels • Radiac Abrasive Cut-Off Machines and Discs

RADIAC*

PRESCRIPTION FITTED AND CUSTOM-COMPOUNDED MOUNTED POINTS, MOUNTED WHEELS AND INTERNAL GRINDING WHEELS END GUESSING, DELAYS AND ERRORS

Radiac considers every job as a special job. Radiac wheels are actually prescribed for your condition. This "prescription" is custom-compounded and filed. Reorders are made up from the original prescription with great care and accuracy. That's why, with Radiac, you get the right wheel . . . every time! Write for booklet with complete details on Internal Grinding Wheels (booklet #1) and Mounted Points (booklet #2)



RADIAC MOUNTED POINTS & MOUNTED WHEELS
All wheels and points are dressed and finished ready to use (no finishing by you necessary) • All kiln glaze is removed • All are 100% tested to precision tolerances • Concentricity is guaranteed • Special Bakelite cement secures wheel to mandrels • Radiac Mounted Points and Mounted Wheels are available in tough, regular aluminum oxide (brown) or in special aluminum oxide (white or red bond) for greater friability.

RADIAC INTERNAL GRINDING WHEELS
All wheels are 100% tested to precision tolerances • Every wheel is a product of pioneers in the development of internal grinding wheels • Radiac Internal Grinding Wheels are available in tough, regular aluminum oxide (brown); in special aluminum oxide (white or red bond) or a special exclusive "Blue Glass" friable bond which permits an increase in the ratio of cutting grain to bond.

PIONEERS
in the development of mounted points, mounted wheels, and internal grinding wheels.

For Fast Stock Removal, Long Life, Cool Cutting—

RADIAC*

Radiac POR-OS-WAY— Radiac PARAFLEX —Radiac Mounted Points and Mounted Wheels — Radiac Internal Grinding Wheels — Radiac Abrasive Cut-Off Machines and Discs.

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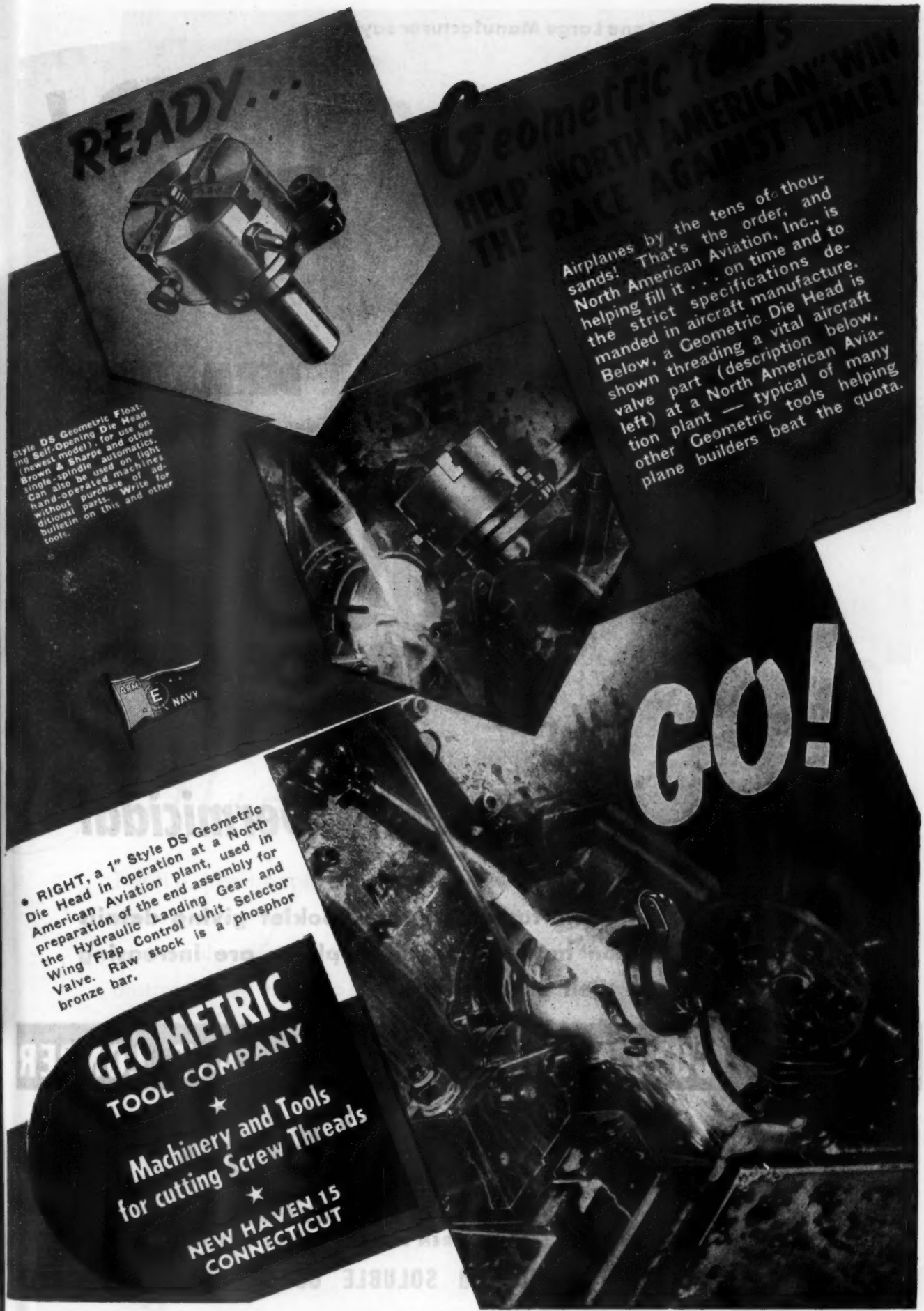
NEW YORK • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • LOS ANGELES


READY...
Style DS Geometric Floating Self-Opening Die Head (newest model), for use on Brown & Sharpe and other single-spindle automatics. Can also be used on light hand-operated machines without purchase of additional parts. Write for bulletin on this and other tools.
Geometric tools HELP "NORTH AMERICAN" WIN THE RACE AGAINST TIME!
Airplanes by the tens of thousands! That's the order, and North American Aviation, Inc., is helping fill it . . . on time and to the strict specifications demanded in aircraft manufacture. Below, a Geometric Die Head is shown threading a vital aircraft valve part (description below, left) at a North American Aviation plant — typical of many other Geometric tools helping plane builders beat the quota.
ARMY E NAVY
GO!
• RIGHT, a 1" Style DS Geometric Die Head in operation at a North American Aviation plant, used in preparation of the end assembly for the Hydraulic Landing Gear and Wing Flap Control Unit Selector Valve. Raw stock is a phosphor bronze bar.
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TOOL COMPANY
★
Machinery and Tools for cutting Screw Threads
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The Safety Department of one Large Manufacturer says:—

5973 MAN HOURS SAVED!

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ELIMINATING OIL DERMATITIS

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TOOLIFE
CUTTING BASE

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It's Actually Germicidal

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Write for descriptive booklet giving details on how thousands of plants are increasing their production.

TOOLIFE — CUTS COOLER . . . TOOLS LAST LONGER

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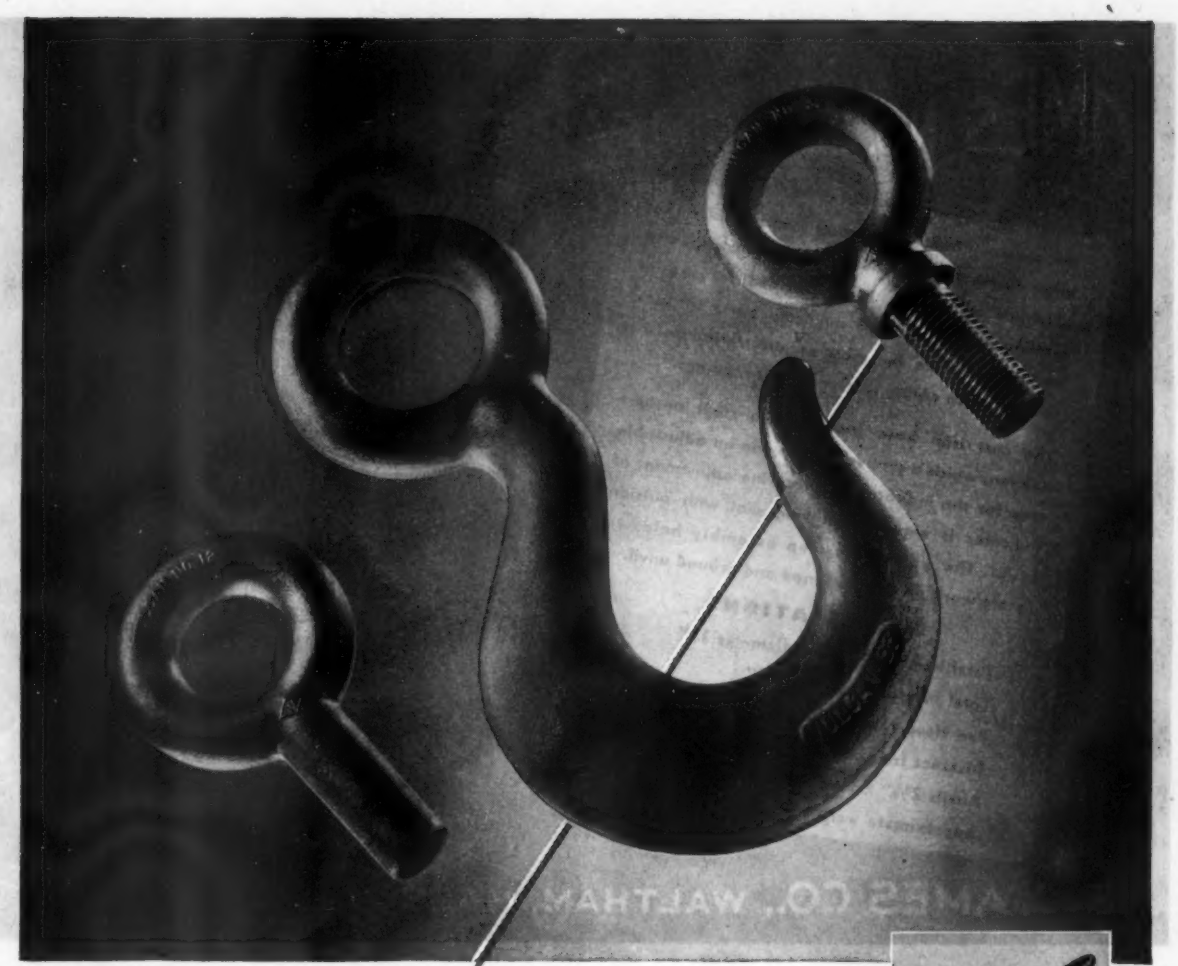
PRODUCTS COMPANY, INC.
190 WARREN STREET · JERSEY CITY, N. J.

Manufacturers of SULPHUR, LARD and SOLUBLE CUTTING OILS and BASES



Battle-Tried Tools

TOOLS, like troops, are a surer bet once they have proved their mettle under the trials of actual combat. In every theatre of action, Williams' Tools have demonstrated their ability to perform and take abuse. When industry again turns to peace-time production, these "veterans" can be assigned your tough jobs with well-earned confidence.

J. H. Williams & Co.,
Buffalo 7, New York.

WILLIAMS
DROP-FORGINGS AND DROP-FORGED TOOLS

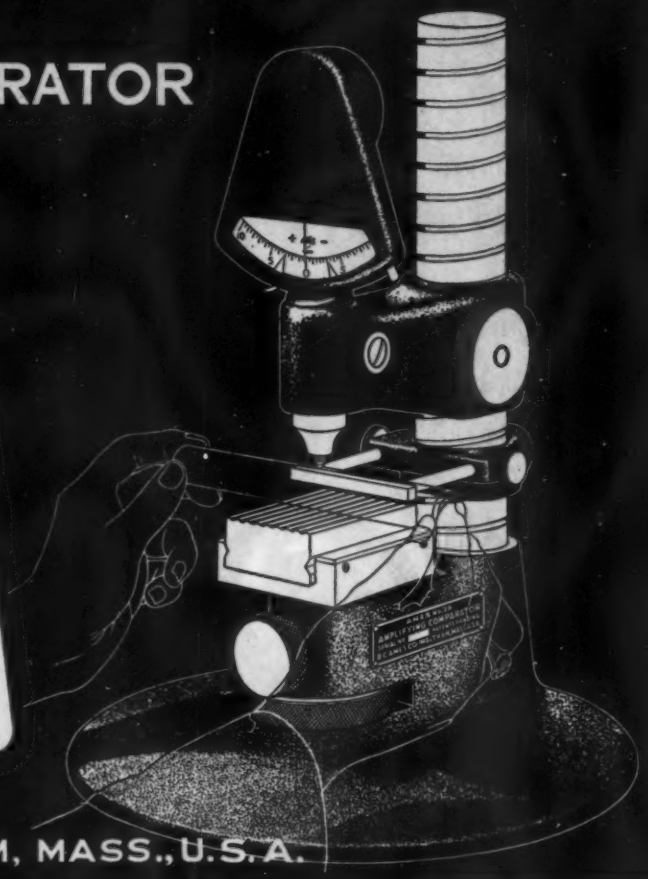
AMES No. 26 COMPARATOR

This precision built Comparator stands solidly on a large diameter base and is heavily constructed to eliminate all spring. It is intended for use in making comparisons of duplicate parts for size and will indicate the most minute variations on the dial, with ability to give repeat readings.

The cast iron base supports the steel upright column, which is grooved to provide an adjustable stop for the indicator bracket. Fine adjustment of indicator is made by moving dial with outside lever. The adjustable stop assembly helps to locate work on the hardened and ground anvil.

SPECIFICATIONS

Total height 15". Base diameter 11".
Total measuring capacity 6"
Fan Head total range .002"
Distance from contact to front of Post 3½"
Anvils 2⅛" x 3¼". Special anvils to order
Approximate weight 40 pounds



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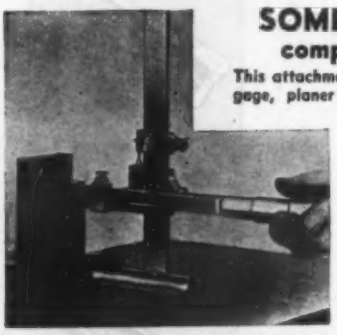

SOMERSET LAYOUT
complete set $16.00

This attachment quickly converts your height gage, planer gage or gage blocks into a tool that can be compared to a jig borer. With it you can layout work easily and accurately. Designed to mark off vertical distance from a plane surface and by the use of the inserted center punch holder, the locating of holes for jigs, fixtures and dies can be accurately obtained. Write for complete details.

SOMERSET TOOL COMPANY
232 Virginia Street — Hillside, New Jersey

COIL STOCK
FEED IT FASTER with **LITTELL**
AUTOMATIC CENTERING
REELS

REEL off your stock for faster production with LITTELL Automatic Centering Reels, for a free-flowing loop of material to presses—hand or automatic feed.

Ask about the Littell line of Reels, Feeds (Roll, Dial, Magazine, Hopper), Straightening Machines, Air-Blast Valves, Pres-Vac Safety Feeders, etc.

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F. J. LITTELL MACHINE CO.
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A.B.C. DRILL JIG BUSHINGS
Prompt Shipment from Stock

Of hardened, ground and finely finished tool steel and made to closest precision in following types:
A.S.A. STANDARD

Head Press Fit
Headless Press Fit
Headless Liners
Fixed Renewable
Slip Renewable

Also—a complete line of accessories carried in stock.

Write for
Catalog No. 243

ABC TRADE MARK

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WETMORE REAM-MOR BLADES PROCESSED

Cut Reaming Costs

• For many years it has been the constant policy of Wetmore to design and manufacture tools for better, more efficient reaming.

In this effort Wetmore has developed Ream-Mor Processed blades . . . . harder—longer wearing—tough—high speed steel blades with qualities of premium alloys at a cost comparable to ordinary high speed steel blades. Try a set on *your* Wetmore Reamers and see for yourself.

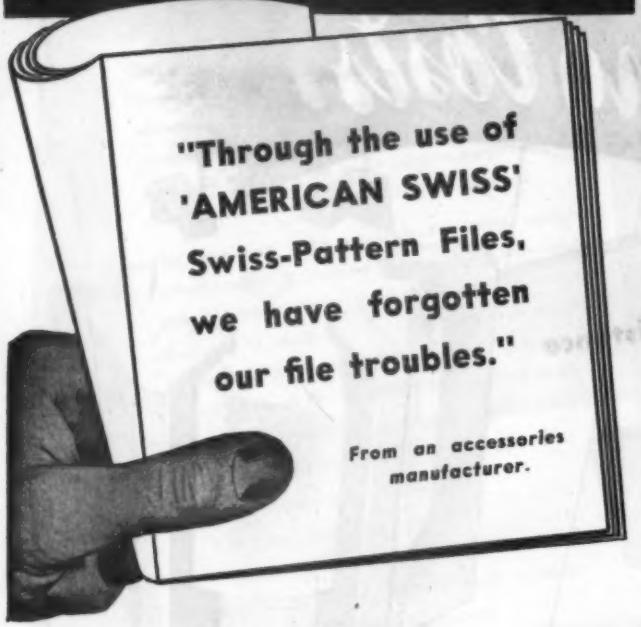
If you have a special reaming problem, Wetmore engineering and experience is at your service.

Send for the New REAM-MOR blade bulletin for complete details.

WETMORE REAMER CO.
410 North 27th Street, Milwaukee 8, Wis.

WETMORE
REAMERS . . . BORING BARS

FROM THE FILES OF "AMERICAN SWISS" FILE SERVICE


"Through the use of 'AMERICAN SWISS' Swiss-Pattern Files, we have forgotten our file troubles."
From an accessories manufacturer.

You, too, can eliminate file troubles . . . secure best results at least costs on your intricate and accurate filing work . . . by standardizing on "AMERICAN SWISS" Swiss-Pattern Files. The tough, strong metal . . . correct and uniform hardness . . . sharp, deeply cut teeth . . . long filing surface of these precision tools assure faster work, longer life, and lowest filing expense.

Furthermore, the large "AMERICAN SWISS" line of more than 3000 different shapes, cuts, and sizes assures an exactly suitable selection for each job, and each file is guaranteed to be perfect in every respect. You are SAFE when you standardize on "AMERICAN SWISS" Files . . . obtainable from our Distributor.

Write for Catalog

American Swiss File & Tool Co., Elizabeth, N. J.

ASK FOR THEM BY NAME

American Swiss

SWISS PATTERN FILES

FULL SPEED NOW—FOR WAR PRODUCTION, BUT HAVE YOUR TOOLING PLANS READY FOR THE GREEN LIGHT OF RECONVERSION

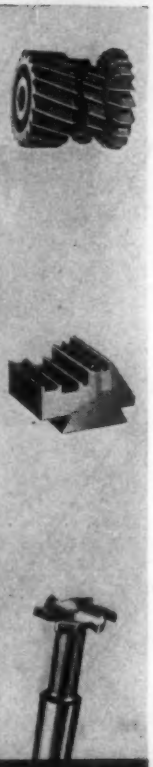
Your plant and our plant are working full blast to end this war quick! But we don't want to win the war and lose the peace.

You and A.C.E. can get together—NOW—on your future tooling plans. You can consult with our Engineering Department on future tooling needs, so that you can have your Hi-Speed or Carbide-Tipped Cutting Tools ready at the earliest possible moment.

In this way you can be sure to get back into civilian production as fast as permissible.

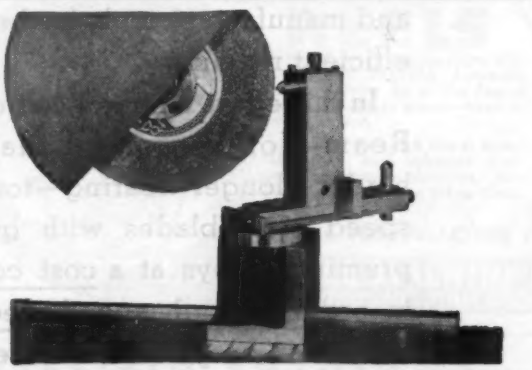
We have appointed a special division of A.C.E. Engineering Department to look after your reconversion plans. Write us today.

AMERICAN CUTTER & ENGINEERING CORP.
31745 Mound Road Warren, Mich.



A.C.E. SPECIAL CUTTING TOOLS *HI-SPEED OR CARBIDE-TIPPED*

The "FORM-MASTER"
ANGLE & RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. diamonds and instrument case included. $150.00.

Readily produces: Any desired angle
Convex radii to 4" on 7" wheel
Concave radii to 7" on 7" wheel

Specifications: Base 3" x 3", height 8½"
Wheel capacity 10"
Angular travel 3"

For information or a demonstration CALL YOUR SUPPLIER

Manufactured by

J. & S. TOOL CO.

477 Main Street East Orange 1, N. J.

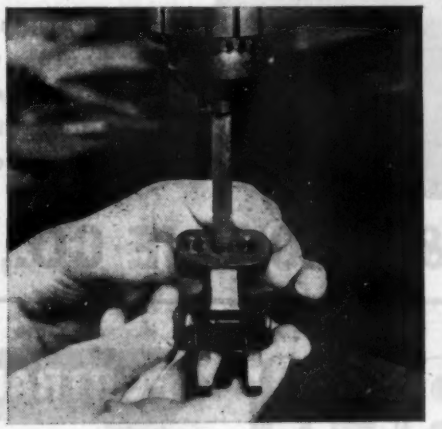
"PRECISION DRESSING TOOLS"

WHEELS THAT LEND WINGS!

Faster, better BURRING, FINISHING, POLISHING operations (as on the close-tolerance parts illustrated) are multiplied many-fold in industry by Brightboy . . . versatility unheard of in finishing operations. The soft rubber, binding the evenly distributed abrasive, does it.

Ask your distributor or a Brightboy service representative how Brightboy can do your usual — and unusual jobs — present and planned-for. And ask for Brightboy prices, catalogs and production data.

Breaking flash on inside of elbow control arm.



Removing burrs from inside of guide hole.

Removing burrs, polishing base of elbow tube.

(Below) Control arm, breaking flash, removing burrs, polishing shoulder.

BRIGHTBOY INDUSTRIAL DIVISION

WELDON ROBERTS RUBBER CO. **Newark 7, N. J.**

WELDON ROBERTS

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QUADRO *Precision* LIVE CENTERS

Manufactured in all tapers and sizes.

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Write for Circular.

FOUR ROWS OF PRECISION BALL BEARINGS

QUADRO LIVE CENTERS combine the rigidity of the solid lathe center with the frictionless properties of the ball bearing to form a tool which will increase production without sacrificing accuracy.

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838 BROADWAY
NEW YORK 3, N. Y.

PALMGREN *ANGLE VISES*

DRILLING
MILLING
GRINDING
FILING
FITTING
MARKING

Solve Difficult Angle Jobs

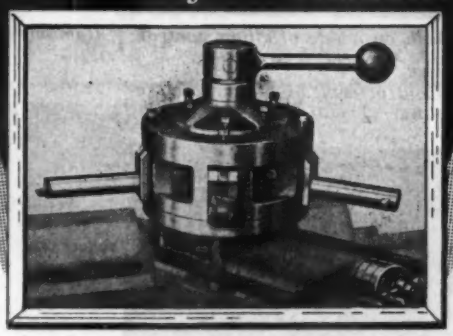
- ★ For Tool Room — Production Line — Bench.
- ★ Speed up work — End Makeshift Methods.
- ★ Quick Accurate Setups at any angle.
- ★ Sturdy Longlife Construction.
- ★ All Parts Accurately Machined.
- ★ Jaws Hardened Steel — Plain or Grooved.
- ★ Made in Sizes from 1½" to 8" Jaws.

Write for circular AM-112 "102 Angle Operations" and complete line of PALMGREN Vises.

CHICAGO TOOL & ENGINEERING COMPANY
Mfrs. of PALMGREN PRODUCTS for over 25 years
2048 South Chicago Avenue, Chicago 17, Ill.

PRECISION WORK AT ANY ANGLE

PORTRAIT *of* A TIMESAVER



5 STATION LATHE TURRETS ARE VITAL TO PRODUCTION

1 SAVE TIME **2**

JUST A TURN AND A LIFT OF THE HANDLE BRINGS ONE OF FIVE TOOLS IN POSITION

THIS, WITH TEN ACCURATE INDEXED TOOL POSITIONS ALLOWS MINUTE ADJUSTMENTS

Time saved brings VICTORY that much nearer. Our NEW IMPROVED TURRET HEADS are built to take heavy cuts, and give precision service. Inexperienced help can quickly become fast operators with these NEW IMPROVED TURRET HEADS.

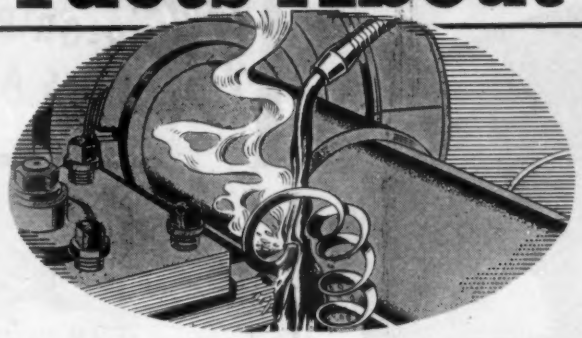
MADE UP IN FOUR INDIVIDUAL SIZES

For Lathes From 9" to 30" Swing — Write Today for Details

AUTOMATIC MACHINE & TOOL CO.
ENGINEERED PRODUCTS
AUBURNDALE, MASSACHUSETTS

CHARLES STREET — AUBURNDALE MASS

Cold Facts About Hot Oil



Keep Your Cutting Oil Cool with a GRAY-MILLS Fluid Refrigerating System

To Prolong Tool Life • Increase Production • Maintain Closer Tolerance Control
Prevent Coolant Loss • Improve Working Conditions • Effect Production Cost Savings

Hot cutting oil kills tools—holds down production—causes costly tolerance headaches and the inevitable rejects. Hot oil fumes make working conditions tough for machine tool operators. Winter or Summer these profit-destroying factors exist.

To combat this, you no longer have to hold down cutting speed and production to obtain reasonable tool life—no longer is it necessary to use a soluble oil where the qualities of a sulphurized oil are really needed. Independent tests and actual case histories prove—with cold facts—that the problem can be solved with a GRAY-MILLS Fluid Refrigerating System.

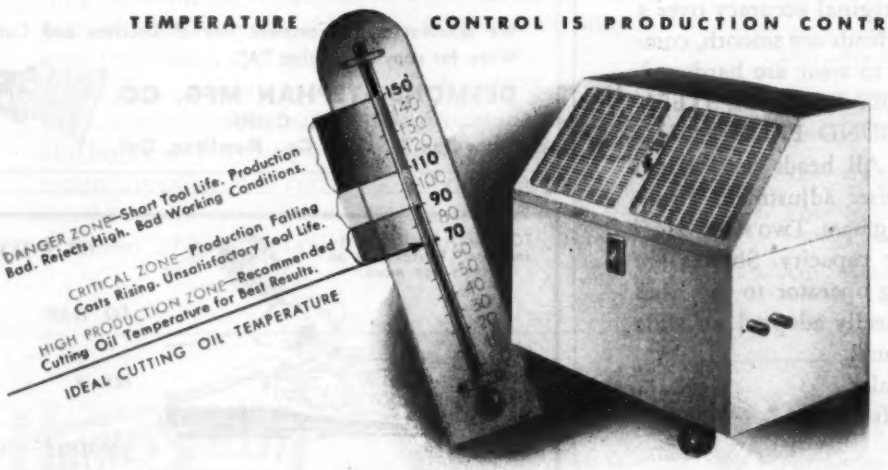
The model 400, for example, cools the cutting fluid, settles out abrasives, controls temperature and applies. It is used on screw machines, honing machines, grinders, gear cutters and other heat generating machine tools. Although the 400 is a compact, portable unit, GRAY-MILLS Systems are engineered to suit any requirements. In one plant, for example, cutting oil for twenty screw machines is cooled and supplied by one central system.

Oil temperature control with a GRAY-MILLS unit enables you to get the most out of every machine—to lower costs *now*—and in the competitive post-war period. It is a wise investment.

GRAY-MILLS Tool and Refrigeration Engineers are at your service. They will be glad to analyze your production requirements and problems and make recommendations. *Write today.*

SEND FOR THESE INTERESTING CASE HISTORIES. *They tell the story in facts. Along with these histories you will receive complete information and specifications on* GRAY-MILLS *Industrial Fluid Refrigerating Systems.*

TEMPERATURE CONTROL IS PRODUCTION CONTROL


150
110
90
70
DANGER ZONE—Short Tool Life. Production Bad. Rejects High. Bad Working Conditions.
CRITICAL ZONE—Production Falling Costs Rising. Unsatisfactory Tool Life.
HIGH PRODUCTION ZONE—Recommended Cutting Oil Temperature for Best Results.
IDEAL CUTTING OIL TEMPERATURE

GRAY-MILLS MODEL 400 FLUID REFRIGERATING SYSTEM—Self-Contained. Mechanical Refrigeration. No Water Required—Fully Portable.

GRAY-MILLS

INDUSTRIAL FLUID REFRIGERATING SYSTEMS

For Cooling Cutting Oils • Quenching Oils • Hydraulic Oils and Other Industrial Fluids

GRAY-MILLS CO. • 1953 RIDGE AVENUE • EVANSTON, ILLINOIS

CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Johnson's SHUR-GRIP DRILL VISE HAS A 3 WAY USE!

$15.50 EACH

In addition to holding round parts as illustrated above, the SHUR GRIP is designed to locate flat or rectangular parts.

Rectangular parts can be held in vertical or horizontal positions and the vise jaws contain V grooves for holding rounds up to 2" in diameter.

The SHUR GRIP reduces set-up time on drilling jobs by 75% to 90%. Why not install one or more in your drilling dept. today? Write now for illustrated bulletin, address Dept. A

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GRINDING WHEEL DRESSERS

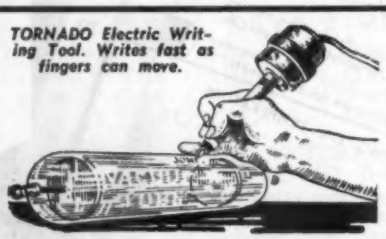
Desmond Cutter

Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

DESMOND-STEPHAN MFG. CO.
URBANA, OHIO
Canadian D-S Mfg. Co., Hamilton, Ont.

TORNADO Electric Writing Tool. Writes fast as fingers can move.



—as easy to use as a pencil—

TORNADO WRITING and ETCHING TOOLS

TORNADO Electric Writing Tool is used for marking everything—brass, marble, tile, glass, plastic, wood, hard rubber, aluminum, steel and bronze.

TORNADO Electric Etchers are used for marking valuable dies, tools and other portable equipment. Contact point of Etcher, when applied to product, burns permanent identification. *WRITE FOR COMPLETE DETAILS*

BREUER ELECTRIC MFG. CO. 5084 N. Ravenswood Ave. Chicago 40, Ill.

Because They Remain Accurate Longer

Precision Plug and Thread Gages Are Made of HAYNES STELLITE Alloy

● HAYNES STELLITE alloy has been adopted by a leading gage manufacturer as the standard material for making precision plug and thread gages. This was done because wear tests proved that these gages will remain accurate and usable longer than those made from any of 18 other materials tested.

Because of their low coefficient of friction and their outstanding resistance to wear, abrasion, and corrosion, gages made of HAYNES STELLITE alloy keep their exact gaging sizes longer.

The same properties that make HAYNES STELLITE alloy the ideal material for precision gages are also important in many other products where a hard, tough, abrasion- and corrosion-resistant material is needed. Send for further information and let us help you with any application you have in mind.

Only HAYNES STELLITE Alloys Offer All These Advantages

1. They resist wear and abrasion.
2. They are inherently hard — even at red heat.
3. They retain their good mechanical properties at high temperatures.
4. They resist atmospheric corrosion and corrosive chemicals.
5. They take and keep a high polish.
6. They have a low coefficient of friction.
7. They are practically non-magnetic.
8. They have a coefficient of expansion similar to that of steel.
9. They can be supplied in the form of castings, small sheets, and welding rod.

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RED-HARD, WEAR-RESISTING ALLOY OF COBALT, CHROMIUM, AND TUNGSTEN.

"HAYNES STELLITE" is a registered trade-mark of the Haynes Stellite Company.

Check-List of Tools and Parts

made — and made better —

by MO-MAX

TRADE MARK REG. U.S. PAT. OFF.

HIGH SPEED STEEL

A glance down the lengthening list of tools and parts in which MO-MAX has been successfully used, emphasizes the opportunities that have re-opened now that this high speed steel is again available. You can now utilize the material that was first introduced, a new idea in basic composition — the first commercially successful molybdenum high speed steel.

With ten years of success behind it... established with tried, tested and proved performance... the basic composition of MO-MAX is as sound today as when it was first offered to the consumer.

Where toughness, and resistance to abrasion are essential... where outstanding machinability, particularly in grinding, is desired — investigate MO-MAX.

Among the products made of MO-MAX

- Broaches
- Counterbores
- Circular Forming Tools
- Circular Saws
- Cutters
- Dies for Hot and Cold Work
- Drills
- Drill Press Gears
- Flat Forming Tools
- Hack Saw Blades
- Hobs
- Lathe Centers
- Machine Plates
- Metal Marking Stamps
- Milling Cutters
- Reamers
- Slitting Saws
- Spot Facers
- Taps
- Thread Chasers
- Thread Rolling Dies
- Tool Bits

Send the coupon for your copy of a newly revised question-answering technical data book.

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street, Cleveland 14, Ohio.

Please send me a copy of your new technical data book on MO-MAX High Speed Steel.

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Position_____

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THEY'RE ALL MO-MAX

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"Mohican"	Atlas Steels, Ltd.	"Rex-T-Mo"	Halcomb Steel Co.
"Bethlehem HM"	Bethlehem Steel Company	"Mogul"	Jessop Steel Company
"Mo-Cut"	Braeburn Alloy Steel Corp.	"Tatmo"	Latrobe Electric Steel Co.
"Star Max"	The Carpenter Steel Co.	"S. T. M."	Simonds Saw and Steel Co.
"Molite 8"	Columbia Tool Steel Company	"Mo-Tung"	Universal-Cyclops Steel Corp.
"Rex-T-Mo"	Crucible Steel Co. of America	"8-N-2"	Vanadium-Alloys Steel Co.
		"Vul-Mo"	Vulcan Crucible Steel Co.

Because They're Small They Have To Be Good

The smaller the grinding wheel, the more critical its quality. Each grain has all the greater responsibility. But small grinding wheels are more difficult to *make* than larger ones—it requires extra care to control consistency of the abrasives throughout each mounted wheel or point and from one to another. Bay State overcomes the difficulty by special manufacturing procedures which result in a better product, easier to use and with longer life.

Each Blue Flash mounted wheel or point is *turned down* from a large blank, and is sized and shaped *on* its own mandrel. Thus, they

need no breaking-in period, because they are dressed as they are shaped.

run absolutely true, because each is concentric to its mandrel.

have no hard and soft spots, because the consistency of grain and bond is uniform throughout.

can be used right down to the mandrel, because the manufacturing process automatically provides a positive test for adhesion of abrasive to mandrel.

These advantages of Blue Flash Mounted Wheels and Points are typical of what you can expect from the entire Blue Flash line. Into each type of product, Bay State builds *extras* that can be easily appreciated when on the job. Write for literature on the products you use—including the handy, pocket-sized catalog on mounted wheels and points.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS

MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS

NEW! Just coming off the Press!

OPERATOR'S MANUAL

Written to save Time, Money and Tools for Users of

"HARDSTEEL"

DRILLS • TOOL BITS AND TOOL TIPS

This book will be sent without charge to engineers, shop executives and machine operators.

It contains a wealth of information on the "HARDSTEEL" technique of drilling steels hardened by any method and the machining of tough abrasive metals—24 pages of text, illustrations and tables—summing up the experience of our own research engineers and thousands of users who have employed "HARDSTEEL" Drills, Tool Bits and Tool Tips on all kinds of work.

Write for your copy today.

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1400 EAST 222nd STREET • CLEVELAND 17, OHIO

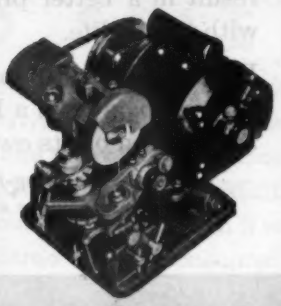
"HARDSTEEL"
DRILLS · TOOL BITS · SPECIAL TOOLS

Waltham
CUTTER SHARPENER

For fast, economical, accurate sharpening of cutters for gear cutting and thread milling, circular form tools, straight fluted hobs, and multiple cutters not over 2" in diameter and 3/8" thick. Standard machine uses index plates. Pawl attachment for locating on top or back of teeth available as extra.

Send for Bulletin No. 344 which gives complete construction and operating details.

ECONOMICAL
FAST, ACCURATE
EASILY OPERATED



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BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — ARTS-AN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS

Almond Drill Chuck

The Original Manufacturers of Drill Chucks

As Pioneers in their field, ALMOND THREE-JAW DRILL CHUCKS have played an important part in machine tool development. They were the first to be placed on the market more than seventy years ago.

Types and sizes are available to fit all machine tools and portable drills.

Write for complete information.

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U.S.A.

Severance new tool craftsmen regrind worn tools with the same precise skill they use in making new tools. They give each flute the pitch and depth required to eliminate chatter. They carefully grind each tooth so your renewed tools take deep sharp bites like a new Severance Cutter. Each tool is given the Severite heat treat process that increases tooth hardness and length-ens cutting life 3 to 5 times. It will pay you to send your worn and dull cutters (hand ground, mill or chisel cut) to Severance for a factory regrind job.

Severance

Midget Milling Cutters • Precision Regrinding

SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN • PLANTS IN LONG ISLAND CITY 1, NEW YORK; DETROIT 2, MICHIGAN; FORT WAYNE, INDIANA; CHICAGO 6, ILLINOIS; AND LOS ANGELES 21, CALIFORNIA. IN CANADA: 60 FRONT STREET WEST, TORONTO, ONTARIO.

Deepfreeze Cascade −120° F. Industrial Chilling Machine designed for numerous high production cold treating operations.

GAUGE GROWTH ELIMINATED AFTER *Cold Treating* IN A Deepfreeze Industrial Chilling Machine

"H" type pin gauges completely stabilized by cold treating.

In Addition, Gauge Life Lengthened as a Result of Increased Metal Hardness

Here is a typical example of how manufacturers are using cold treating to stabilize gauges and other precision machine parts. Under conventional production methods the "H" type pin gauges shown above grew as much as .001" to .0015" while stored in tool cribs. Now, after cold treating, at −120° F. in a Deepfreeze Industrial Chilling Machine before final machining, the gauges hold their original dimensions for indefinite periods of time. In addition, the increased hardness of the metal obtained in the same cold treatment resulted in improved wearing quality of the gauges.

COLD TREATING FACTS

MACHINE—Deepfreeze — 120° F. Industrial Chilling Machine.

PART—"H" type pin gauges.

GAUGE SIZES—3.000 4.330, 5.000, 6.250, 7.000.

MATERIAL—S.A.E. 1095 Carbon Tool Steel for gauging blocks; cross piece from cold rolled bars.

TREATING PROCEDURE—(1) Heat to 1450° F.; (2) water quenched; (3) immersed in water approximately 210° F. for 1 ½ hours; (4) return to room temperature; (5) transfer to Deepfreeze at — 120° F. for 1 ½ hours; (6) return to room temperature; (7) given a draw of 375° F. for 1 ½ hours; (8) cooled to room temperature; (9) return to Deepfreeze for 1 ½ hours; (10) return to room temperature; (11) immersed in hot water at 210° F. for 1 ½ hours; (12) return to room temperature; (13) again cold treated in Deepfreeze at — 120° F. for 1 ½ hours; (14) return to room temperature; (15) finished ground to size.

NOTE: Every effort was made to make the rise and fall of the temperature continuous without any prolonged rest between the hot and cold point reached.

RESULTS: These gauges were checked for size immediately after cold treatment, then four months later, and once again two months later. It was found that growth was held to a maximum of .00004" as compared to the previous growth of .0015."

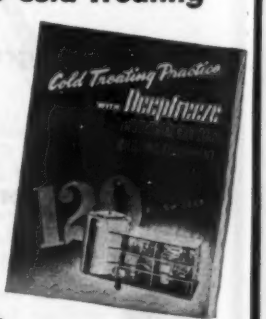
How Others Are Using Cold Treating

Cold treating is being practically applied at present by numerous manufacturers of diversified products for the following purposes:

Treating of high-speed steel cutting tools.
Shrinking of metal.
Shrink-fit assembly.
Stabilization of gauges.
Hardening precision machine parts.
Testing of aircraft instruments and materials.
Testing of lubricants, paints, plastics, chemicals, synthetic rubber and pharmaceuticals.

FREE *Complete, Up-to-date Cold Treating Information...*

Our new 40-page booklet covers every phase of cold treating from its inception to the present time. It gives specific information on how such manufacturers as Curtiss-Wright Corporation, Cincinnati Milling Machine Company, Ford Motor Company, Savage Tool Company, Kearney & Trecker Corporation, and many other Deepfreeze users are applying cold treating to their production. Write today for Bulletin No. 1-4.



Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

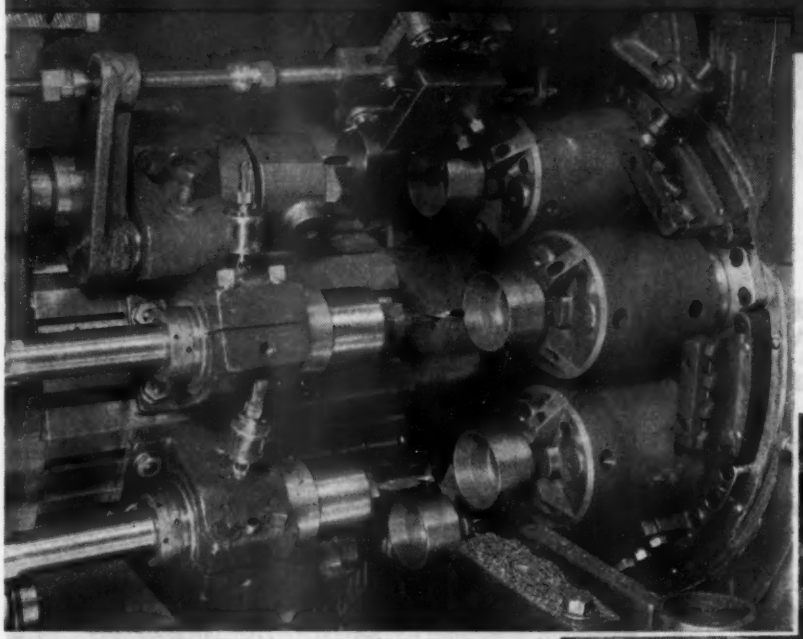
2327 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Mich

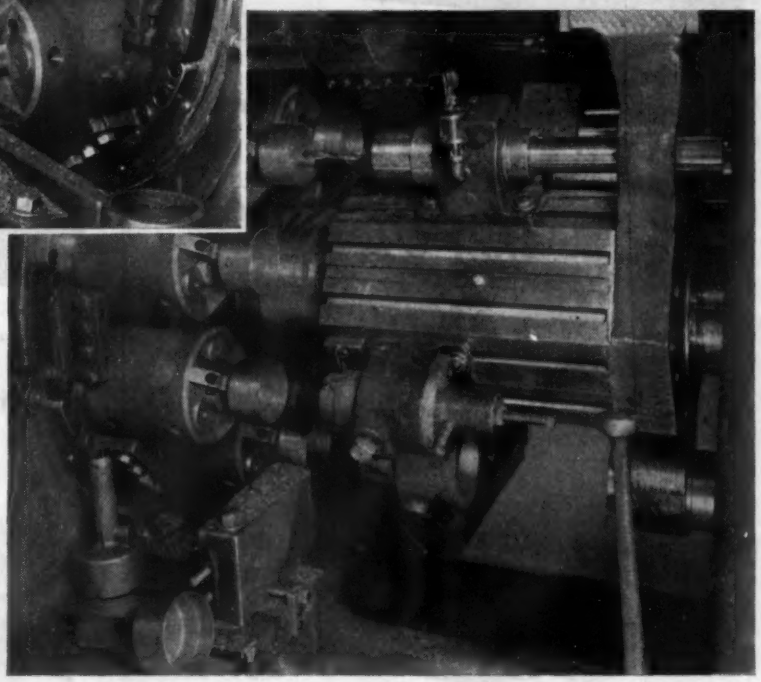
Picture of Costs Going Down



Looking ahead, it's a safe prediction that sales volume is going to depend largely upon selling price.

That's where Acme-Gridley Automatics can help you most. They produce *more* for *less*.

Because they make possible lower selling prices, Acme-Gridleys are as important to the sales department as they are to the plant.



You may have jobs like this

Here is the setup—on a 6″ 8-spindle Acme-Gridley Chucker—for finishing the cup of a cast-iron distributor housing. 25 tools are required.

The stem end is also finished on the same size machine, in a setup using 17 tools. High speed and automatic operation cut machine costs lower than ever before, without any loss of precision.

Acme-Gridleys can use *more* tools—carbide-tipped or tool-steel—in multiple operations. They save buying special machines, save floor space, save time. And notice the unusual accessibility of the entire tooling area.

For doing business in highly competitive postwar markets, it will pay to discuss with us lower chucking machine costs.

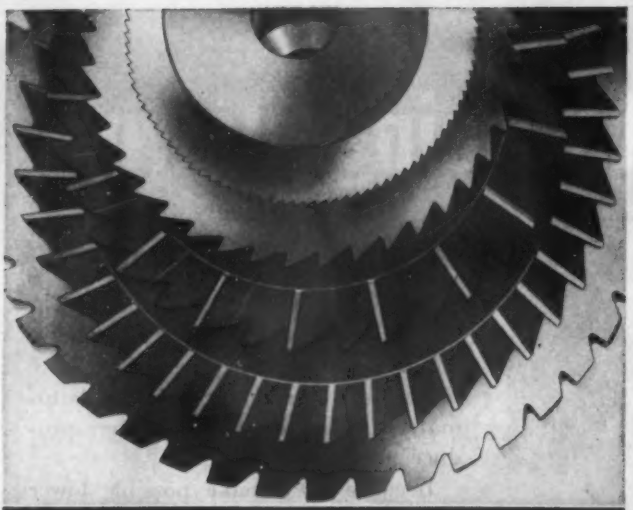
Here are more Cost-cutting Ideas

You'll find in this book jobs that point the way to like cost cutting in your own plant. May we send you a copy—ask for Bulletin CM-44.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND 8, OHIO

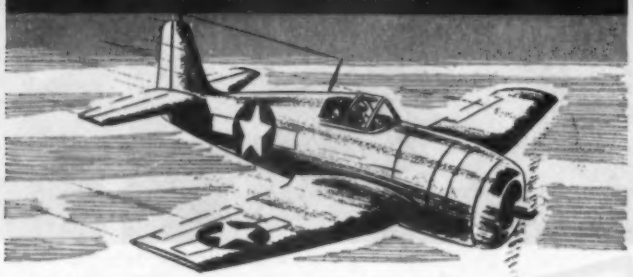
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS
THE CHRONOLOG • LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING



CIRCLE R Metal Cutting Saws

BUILT BY
PERFECTIONISTS
FOR
Exacting Operations

The Famous GRUMMAN HELLCAT



Circle R Saws and Grumman Hellcat fighters have this in common; both are made by perfectionists to accomplish today's difficult and exacting tasks.

R

CIRCULAR TOOL CO., Inc.

PROVIDENCE 5, R. I.

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LOS ANGELES · ROCHESTER · INDIANAPOLIS · DETROIT · ST. LOUIS

Columbia
TOOL STEEL

NEW AND BETTER
Your new know-how with "Good Tool Steel" can make new and better tools for the production of the new and better articles needed after the war.
It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
540 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

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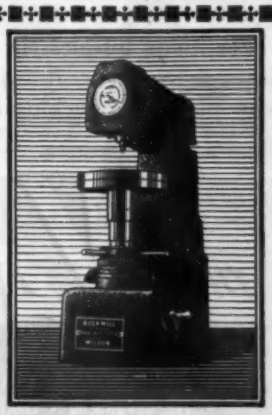
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

"ROCKWELL"
HARDNESS TESTER

These new improved type testers available from stock.

Made by us for 23 years and still made by us only.



WILSON
MECHANICAL INSTRUMENT CO. INC.
Concord Ave., New York 54
An Associate Company of American Chain & Cable Company, Inc.

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DRESSING TOOL COMPANY

Detroit, Michigan

For CENTERING PARTS and SHAFTS.

You Save Time and Material — and INCREASE Your Shop Output with the

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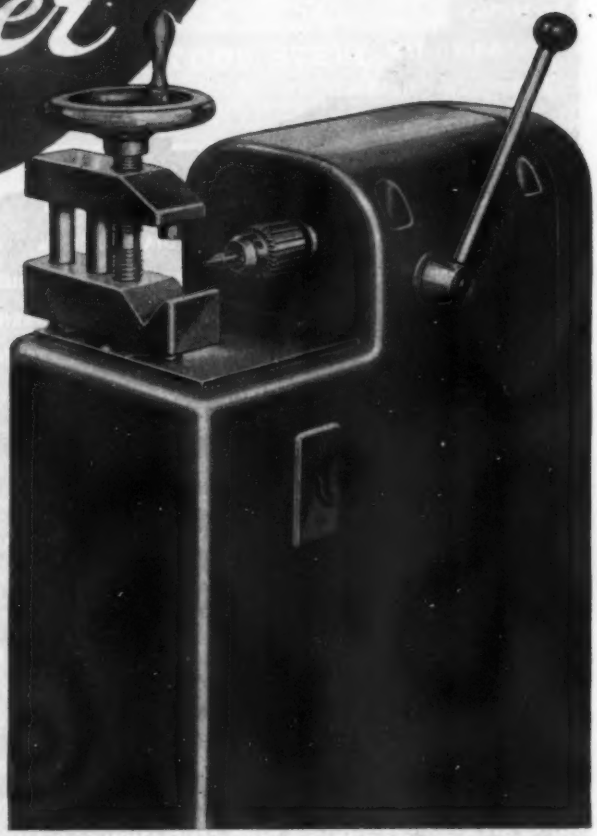

THIS machine is a speedy, easy and accurate performer. It's so easy to use that any workman can handle it. You simply insert one end in the Vee-Block, tighten the hand wheel and advance the center drill—then reverse the bar and center the other end. The **Quickcenter** will do in less than a minute a job that may take over half an hour on a lathe — and do it far more easily and more accurately. The **Quickcenter,** small and compact, increases shop output, uses unskilled operators, saves time and material—and increases your profit.

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MURCHEY MACHINE & TOOL CO.

DETROIT 26, MICH.

From 1/2 inch to 3 inch Round Bars

MURCHEY

Figure it out for Yourself

BROACHING

Means Lower Cost

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CAPITAL INVESTMENT

The slightly higher cost of broaching equipment and tooling is more than compensated for by extremely high production rates and exceptionally long tool life.

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Completely unskilled labor is used on broaching machines. The operator has merely to load and unload the fixture. Greater machine efficiency also means fewer operators are needed to maintain production rates.

MAINTENANCE

The long life of broaches make the cost of sharpening them very low in relation to the number of pieces machined.

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Broaching often makes it possible to combine several operations on one machine. It is possible, on certain types of parts, to cut on three sides of a part with one stroke.

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One broaching machine often has replaced as many as eight or ten machines of other types while increasing the production rate.

When you plan new tooling, call in a Detroit Broach engineer. Let him show you where broaching can give you more and better production at lower cost. Complete cost and production data will be cheerfully submitted without obligation.

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DETROIT *Broach* COMPANY

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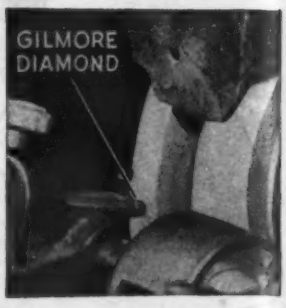
GILMORE DIAMOND TOOLS

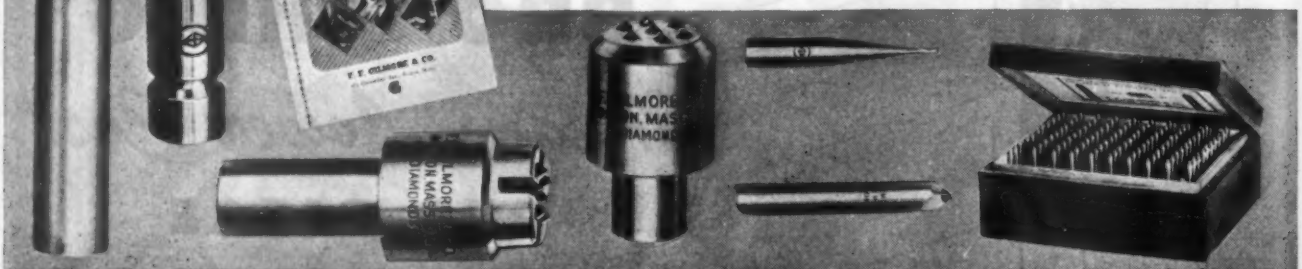
play an important part in truing the precision grinding wheels of leading shops



Gilmore service—in developing and furnishing Diamond Tools to meet the varied and extensive requirements of the metal working industries—is of accepted and recognized value. As specialists of long experience in the manufacture of Diamond Tools, and in diamond cutting, Gilmore has kept pace with grinding technique and its recent highly specialized demands.

The Gilmore line has been developed to meet the present needs of precision grinding and is complete with Diamond Tools to meet every dressing need for every type of wheel.

Investigate the scope of Gilmore service by sending for illustrated literature covering the Diamond Tools available from Gilmore. Outline your wheel dressing problem and ask Gilmore to recommend a solution.



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MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

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All Parts Fully Enclosed to Insure Pressure Lubrication Rigid Support of and Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

Available from Stock

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SCREWS and NUTS

Brass or Steel, Cut Thread Class 3 Fit

Waltham is also equipped to furnish all types of

SPECIAL MACHINE SCREWS and SCREW MACHINE WORK

manufactured to special order.

Write for Catalog and Price List.

WALTHAM SCREW CO.

WALTHAM, MASS.

Set-up men, assistant foremen, leadmen and workers say

SMOOTH OPERATION
PLENTY OF POWER
LIGHT WEIGHT
HANDLING EASE

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RIVET SQUEEZER

the best liked tool for the job

Rivet Squeezer with "C" Type Yoke.

Rivet Squeezer with Alligator Jaws of 1½" reach.

Rivet Squeezer with Alligator Jaws of 2½" reach.

The Thor PRS-10 Pneumatic Rivet Squeezer is the most powerful machine of its size on the market. Having a rated capacity for driving ⅛" aluminum, Dural or soft iron rivets, it can also be used for dimpling, pressing and similar operations. It is available in three styles—for "C" type yoke and with alligator jaws of 1-½" or 2-½" reach.

Its balance in conjunction with properly located throttle lever, and its finely graduated control, enable the operator to properly align the plunger or anvils over the rivet before applying the final squeezing stroke.

The design is streamlined; completely enclosed; air-actuated power and return strokes eliminating springs; full roller bearing construction. No strains are transmitted to the aluminum casing, which serves only as a locating medium and housing for the power transmitting mechanism.

Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

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For complete technical data and prices write today for Bulletin No. P-1232.

DOUBLE-CUT MILLED TOOTH VIXEN FILES

for many years . . .

HAVE GIVEN QUICK PERFORMANCE ON BOTH HARD AND SOFT METALS AND OTHER MATERIALS

Of a distinctive milled cut tooth design, this 14" Heller VIXEN Flat Double-Cut Milled Tooth File, No. 859, is particularly recommended for such soft metals and materials as babbitt, brass, bronze, copper, aluminum, lead, plastics and fiber. It has been widely used FOR MANY YEARS on hard and soft rubber and in metal pattern work.

As its name indicates, it is a *double-cut milled* tooth file. The rows of teeth are spaced wider toward one side of the file than they are toward the other. The result is the characteristic tooth design illustrated that enables this special Heller VIXEN to cut both *rapidly* and *smoothly*.

No. 859 VIXEN works with a genuine shearing cut, inasmuch as no two successive teeth in any longitudinal row are in alignment. It produces a much smoother surface in cutting soft materials than is possible if the file teeth were to follow each other at regular intervals. Chattering is eliminated, and a more durable, long-lasting file is obtained.

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America's Oldest File Manufacturers
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GENUINE HELLER VIXEN CURVED TOOTH FILES

Faster non-ferrous metal Cutting

Here's the new band saw that is going places rapidly. Solves the problem of those perplexing new war materials that other blades falter on or can't touch.

The DoALL Buttress does straight line or contour plate stock ripping, shaping of metals, alloys, laminates, plymetals, plastics and if you have any kind of lumber, plywood or builders board, the Buttress will cut them like a sharp knife slicing cheese.

MAGNESIUM
10" thick—120 sq. in. per min.

ALUMINUM 24 ST.
1" thick—160 sq. in. per min.

CAST ALUMINUM
80 to 90 sq. in. per min.

ALUMINUM RISER RINGS
from Castings 90 sq. in. per min.

ALUMINUM ARMOR PLATE
5-16" thick—25 to 30 lin. ft. per min.

BERYLLIUM COPPER
2" thick—2.25 sq. in. per min.

DoALL Buttress
TRADE MARK REG.
THE NEW WIDE-SPACED HARD TOOTH SAW

REQUIRES NO SHARPENING
That means no work stoppage. Let the Buttress sing along for hours, days or weeks—until worn out, then replace with a new blade. This saves time, man hours, blading and money.

Now available in various pitches and widths.

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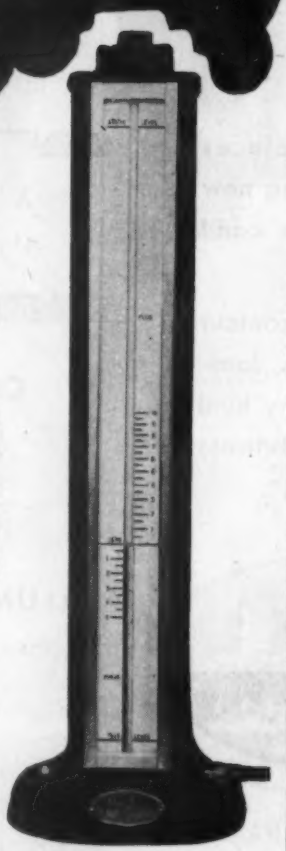

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TAPER and STRAIGHTNESS
SLOTS and THICKNESS
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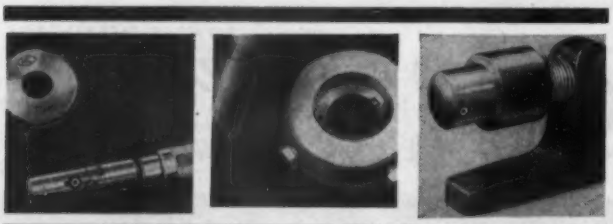
All METRICATOR gages are custom-built—engineered to meet your specific needs, assuring you of greater adaptability and guaranteeing precision accuracy.

METRICATOR gages eliminate human element variations and maintain their high degree of accuracy for a longer period of time in spite of wear.



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ANN ARBOR, MICHIGAN

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• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

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CINCINNATI, OHIO

Step up Efficiency with the H. & H. 6-TOOL TURRET HEAD

Converts any engine or speed lathe into a turret lathe. Standard Arbors for mounting on tailstock furnished.

Made in 3 sizes (overall-diameters): 3¼", 3½" and 5¼".

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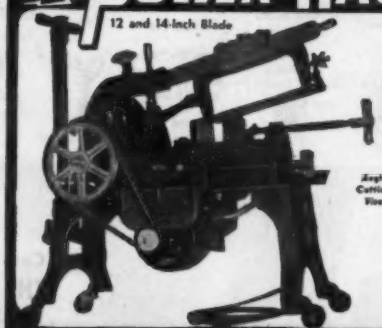
POWER HACK SAW ★

12 and 14-Inch Blade



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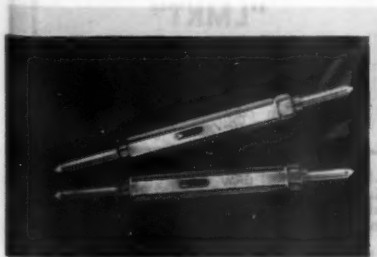
Uniform, mass production of high precision parts is made possible by the use of simple yet extremely precise small hand gages. **VARD** makes these gages and carries in stock, ready for shipment on order, numbers of gage members and handles in thread sizes from 0-80 NF to 1½ in. NC. Cylindrical gages are always made to order. Tapered pipe thread plug gages in sizes of 1/16 in. to 2 in. inside pipe diameter are carried in stock. Pipe gages comply with specification AN-GGG-P-363.

VARD manufactures all types of thread, cylindrical and taper gages. We produce gages to your order in National, Acme, Metric, Lowenherz, British Association or in special modified thread forms.



VARD manufactures high precision cylindrical gages, using the finest production machinery and optical testing equipment

VARD threaded plug gages, especially in very fine thread sizes, are recognized throughout industry for their accuracy

VARD pipe thread and taper gages all conform to aircraft specification AN-GGG-P-363. Small diameter pipe gages require the utmost skill in manufacture

VARD *stands for* Verity · Accuracy · Responsibility · Durability

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UNITED WELDING

Blower impellers, like those above . . . field rings like those below . . . are today regular "grist for our mill". That is war production. Soon, let us hope, things of a more peaceful nature will take their place.

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MIDDLETOWN, OHIO
WELDING FABRICATORS OF MODERN DESIGNS

LAPPING COMPOUNDS

made expressly for precision lapping

• GAGES •
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PLATE . . . MACHINE . . . HAND

• The abrasives are suspended in a special grease composition paste base that becomes an oily film under pressure of lapping. This base was developed expressly for hand, plate and machine lapping.

For dilution or extra lubrication mix with small quantity of thin film oils such as kerosene, spindle.

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Crystolon .....75¢ per lb.
TM. Reg. U. S. Patent Office (silicon carbide)
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(special chrome plate)
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(high reflective finish on steel)
Packed in 8½ and 42 lb. cans
Large Glass Jars, all Grades .....$1.00 each

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Also many other compounds: Valve Grinding, Gear Lapping, Ball Bearing Raceways, Finishing, Polishing—All Types. Write us for samples.

Recommended by Norton Company for use on their Lapping Machines.

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A SCREW THREAD "TASK FORCE" THAT HELPS YOU WIN PRODUCTION BATTLES!

We hear a lot about *teamwork* in this war . . . amphibious and triphibious operations . . . the coordination of land and air and sea forces.

There are similar "task forces" of men and machines and tools in industry, too. Threading metal parts, for example, must be done at high speeds and at accuracies measured in ten-thousandths of an inch or even finer. This has meant the development of a "team" of high speed precision taps and dies to cut the threads . . . plus gages to check the accuracy.

"Greenfield" has devoted itself to the perfecting of this screw thread "task force". It has a country-wide staff of field engineers . . . its "intelligence" . . . continually bringing in reports of operations. It has its "headquarters staff" of trained screw thread and gage engineers to turn these field reports into blue-prints and plans . . . and it has a highly skilled "army" of men and women with the equipment to turn blue-prints into tools . . . the "Greenfield" Taps, Dies, and Gages that together form screw thread "task forces" in the plants of America's metal-working industry.

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Better Threading with Better Tools

GREENFIELD TAP & DIE CORPORATION
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For about 75c per eye—the average cost of AO Safety Goggles—you provide maximum eye protection for each skilled worker and you eliminate expensive eye accidents which run up production costs.

Call in an AO Safety Representative—and keep your "production eyes" producing.

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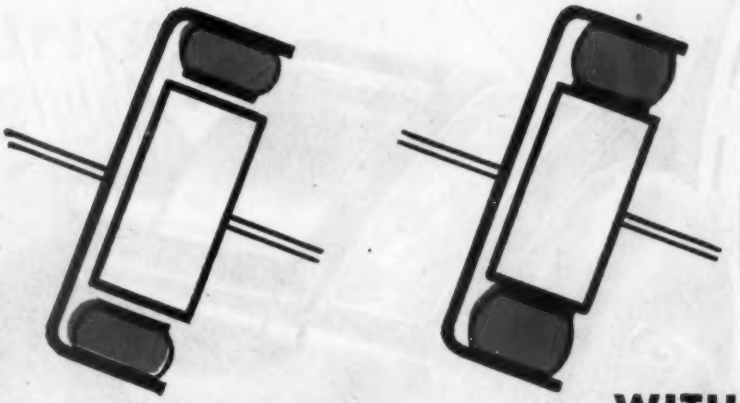
Here's how to get
Air Cushioned Power



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Simple — positive — trouble-free. You inflate that rubber-and-fabric air gland of the Fawick Airflex clutch and you get instant clutch engagement, as firm or as light as the job demands. Deflate and the clutch runs free.

And more! Shocks and vibration are absorbed by a cushion of air. Smooth starts and stops. No moving parts — no springs, arms or levers. No adjustments to make — no lubrication required. Maintenance costs low. Performance and dependability are proved on thousands of naval vessels and on heavy machinery drives throughout industry.

Why not write to our Engineering Department for recommendations based on experience with heavy-duty clutches?

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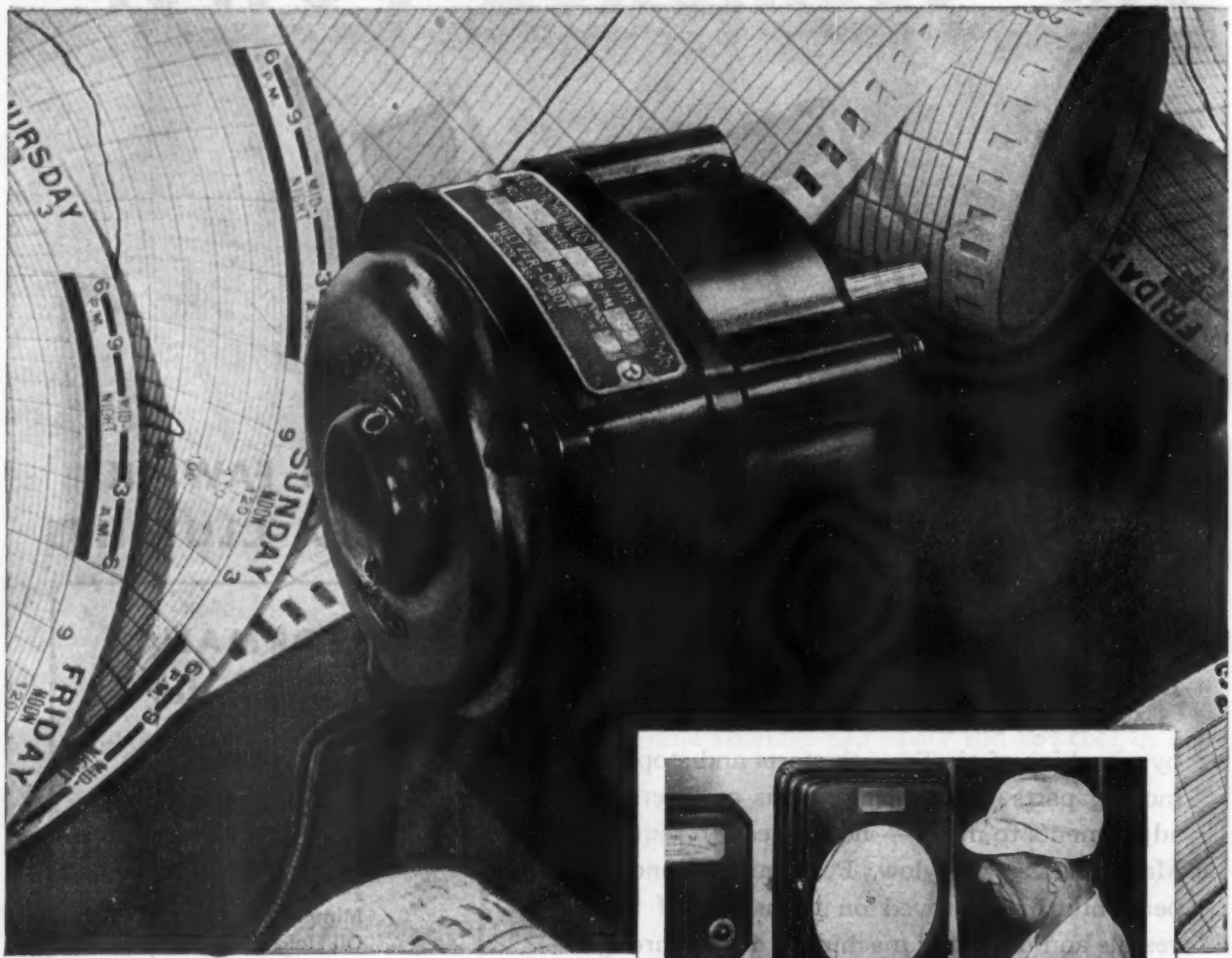
FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR

Increased Power and Constant Speed

...YET FITS MOTOR SPACE AVAILABLE



Typical Recorder Powered with Holtzer-Cabot Motor

The requirements of a manufacturer of instruments called for a constant speed motor that had more power than a standard clock motor previously used, yet still fitted the original space allowed.

Holtzer-Cabot designed the special synchronous motor, illustrated above, which not only filled the performance and space requirements, but saved the manufacturer the cost of redesigning and retooling to take a larger motor, and also made it possible to service instruments in customers' plants which had the old type of motor.

The specialized business of Holtzer-Cabot is the designing and building of special fractional H. P. motors to meet special requirements.

Although today our entire facilities are devoted to building special motors for military use, our motor development engineers will gladly discuss your post-war fractional H. P. motor requirements with you.

Special Motors Designed to Fit the Application

HOLTZER-CABOT

Division of First Industrial Corporation

Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

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Now FEDERAL brings you even FASTER and more Positive

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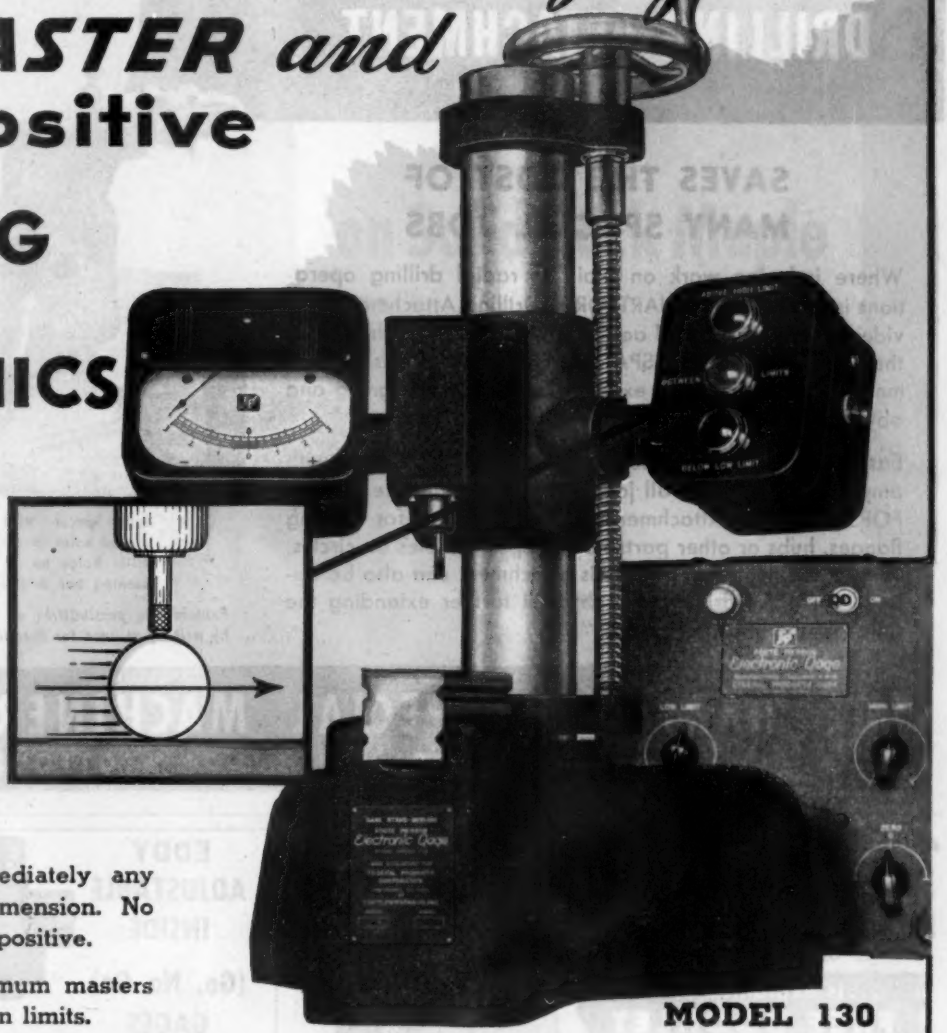

MODEL 130

ONE-PASS INSPECTION

Workpiece is passed *directly* under contact. No stopping and no backstop required. 30 to 60% faster inspection, accurately.

OUTSTANDING BECAUSE—

Limit lights show immediately any variation in specified dimension. No hesitation, no backstop, positive.

No maximum and minimum masters required to set dimension limits.

Unusual wide-range zero adjustment makes setup simpler, faster and more positive.

Contact pressure adjustable from 2 to 16 ozs.

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This Comparator is of great value for high speed, 100% inspection at either Production or Final Inspection. The speed is unusual. There is no necessity for slowly maneuvering the workpiece under the sensitive contact to determine its maximum dimension, nor to bring it to rest against a backstop. Actual time studies indicate savings in inspection time of from 40% to 60%.

Either tolerance lights or the meter scale may be used—the lights for fast, 100% inspection; the scale for selective inspection. The indicating hand swings positively and stops definitely and quickly.

This exceptional Comparator is a decided advance in gaging devices. Its flexibility, range, sensitivity and accuracy are worth investigation.

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Electronic Gage

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The HARTFORD SUPER-SPACER DRILLING ATTACHMENT

SAVES THE COST OF MANY SPECIAL JOBS

Where indexing work on plain or radial drilling operations is involved, the "HARTFORD" Drilling Attachment provides a fast, simple and accurate way to extend the use of the HARTFORD SUPER-SPACER. Furthermore, this attachment saves the time and expense involved in designing and obtaining special jigs and fixtures.

Easily secured to the base of the SUPER-SPACER, and with ample adjustment for all jobs within its range, the "HARTFORD" Drilling Attachment is highly useful for drilling flanges, hubs or other parts having spaced holes on circles. With a supplemental base, this attachment can also be applied to radial drilling, thereby still further extending the utility of the "SUPER-SPACER."

Super-Spacer with drilling attachment drilling spaced holes in a circle. Swings work 11' dia. and drills holes up to ¾" dia. Stop is used when bushing bar is shifted.

Explore the possibilities of the SUPER-SPACER and its attachments by writing at once for detailed information.

THE HARTFORD SPECIAL MACHINERY COMPANY

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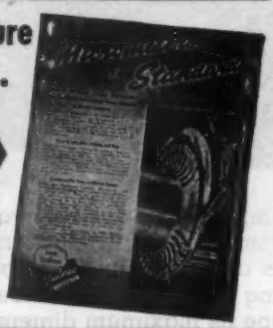
How to Accurately Measure Large* Unwieldy Parts...

* Up to 168"



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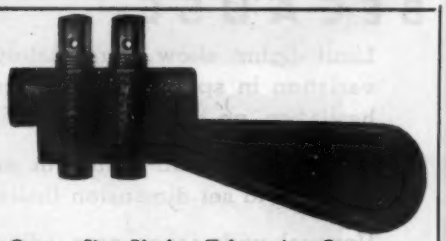

Replace: Plug Gages—Size Blocks—Telescoping Gages
Spring Calipers—Planer Gages—Keyway Gages
Sizes to gage from 1" to 12"

So easy to set that they are practical to use on a single piece—Can be sealed for the more numerous production jobs—Are rigid and cannot change as spring calipers do—Can be used to gage the taper and diameter of a tapered hole—Can be set to micrometers, ring gages, verniers or samples of work.

They also have many other uses—Send for further information

EDDY MANUFACTURING CO.

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brings out the best in cutting fluids!

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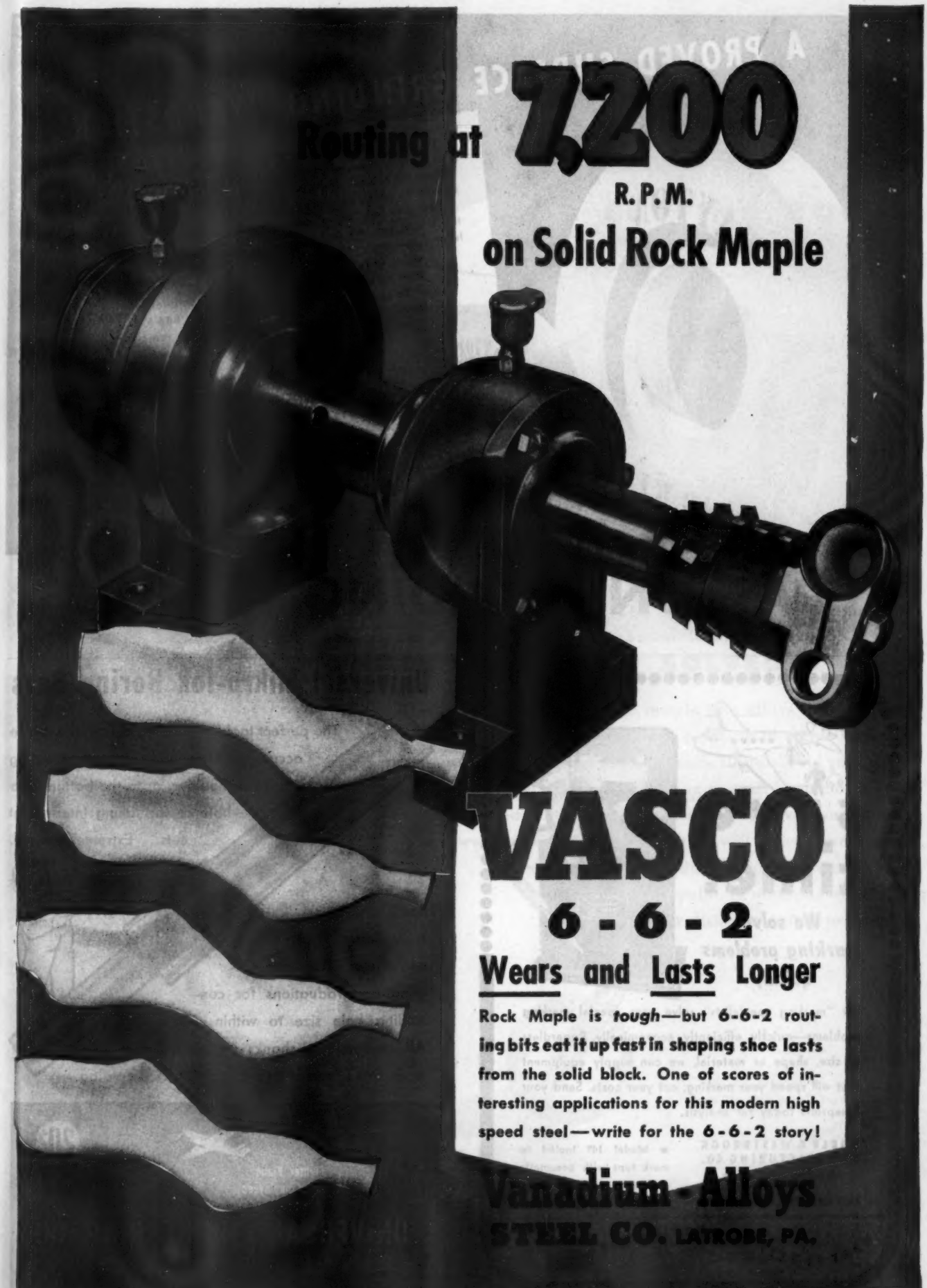
CHICAGO, U. S. A.

Routing at 7,200 R.P.M. on Solid Rock Maple



VASCO 6-6-2

Wears and Lasts Longer

Rock Maple is *tough*—but 6-6-2 routing bits eat it up fast in shaping shoe lasts from the solid block. One of scores of interesting applications for this modern high speed steel—write for the 6-6-2 story!

Vanadium-Alloys STEEL CO. LATROBE, PA.

A PROVED SURFACE GRINDING "YARDSTICK"

If you are feeling your way on some surfacing operation . . . seeking a wheel of the grain, grade and structure that will do the job as your "spec" requires—use the 846 K-1-V Dayton as your "yardstick".

You may find, as so many have found, that it's exactly the wheel you are looking for. If not, you will find it at least surprisingly "close" to what you've got to have. So close, in fact, that selection of the correct wheel can then be made without further experimentation.

To save time, money, worry—put this 846 K-1-V Dayton to the test now. Made in a wide range of sizes—with trial wheels shipped from stock.

Write, wire or phone today.

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DAYTON GRINDING WHEELS

save time!

We solve marking problems quickly

Let "marking specialists" solve your special marking problems—quickly, efficiently, economically. Regardless of size, shape or material, we can supply equipment that will speed your marking, cut your costs. Send your blueprints today for analysis.

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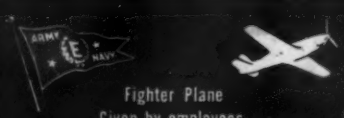
• Model 149 tooled to mark taps with pneumatic uniformity. Completely automatic operation.

MARK IT BEST WITH NOBLEWEST®

Universal Mikro-lok Boring Bars

The perfect tool for finishing cuts with extreme accuracy. Especially adapted to boring to a shoulder, or to the bottom of a hole or for taking intermittent cuts. Extremely rigid.

Easily and quickly adjusted like a micrometer. You can depend on graduations for controlling hole size to within .0005. All standard type shanks available. Singly or in sets. Prompt delivery. Write for catalog.

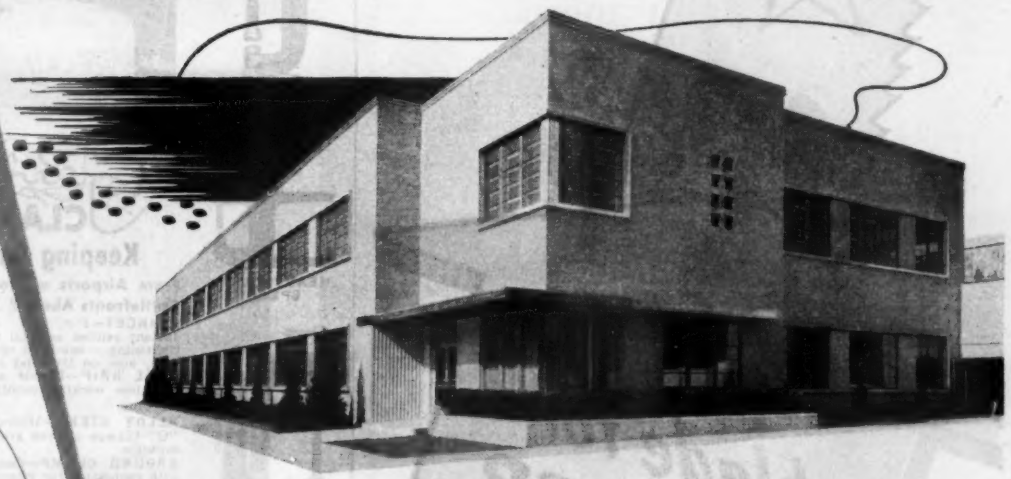


Fighter Plane Given by employees

20% Employees Bond deductions

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

HEADQUARTERS FOR "ENGINEERED" CUTTING TOOLS



WHERE THE *Unusual* IS INVITED... UNDERSTOOD AND SOLVED!

New product designs, lighter metals, new alloys and machine tools with increased feeds and speeds combine to create unusual and complex cutting tool design requirements. Illinois Tool engineers and metallurgists can bring to such problems a vast experience and unmatched facilities for the development and production of special tools that will exactly meet your needs. Consult an Illinois Tool engineer... you will find him capable of understanding and solving your difficult tooling problems.

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MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

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Pick this blade for LONGER metal cutting
AKABLE FLEXIBLE
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CLEMSON
Makers of Hand and Power Hack Saw Blades, Frames, Band Saw Blades and the Clemson D-17 Lawn Machine.
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ASK FOR METAL CUTTING HELP

Fast, accurate, economical metal sawing is based on facts—Use the right blade for the job. Act today—WRITE—and have us send you FREE Clemson Bros.' pocket-size handbook. "Metal Cutting." Clemson Bros., Inc., Middletown, N. Y.

GROUND CLAMP

QUIKCET

HEAVY DUTY SPEED

DUAL GRIP

GRAND Speed CLAMPS

Keeping 'em Flying!

From Airports at Home as well as on Battlefronts Abroad . . .

QUIKCET—For fast (4-second) clamping. Instant ratchet set and release—fulcrum screw tightening—one-hand operation—non-creeping grip, even on irregular surfaces.

DUAL GRIP—Double action—side tightening for close working conditions. No twisting or creeping.

ALLOY STEEL—Medium and heavy service "C" Clamps of even greater than forged clamp capacity.

GROUND CLAMP—Completely copper plated with connection for ground wire.

QUICK LOCKCET—For light, fast work on aluminum and soft metals. Locking lever and instant trigger release.

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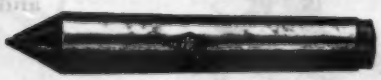
QUICK LOCKCET

GRAND SPECIALTIES CO., 3100 W. Grand Ave., Chicago 22, Ill.



HIGH SPEED CENTERS

FASTER SPEEDS

and

LONGER LIFE

between grinds on lathes and grinders equipped with RED-E High Speed Steel centers because they have high speed steel ends. All tapers and sizes. *Write for Bulletin.*

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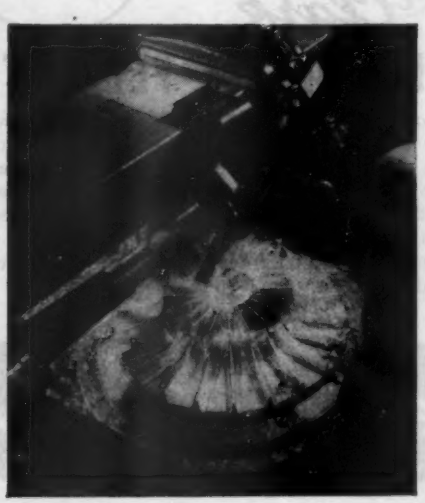
"WITH **Gulf Cut-Aid**

WE INCREASED PRODUCTION ON THIS MILLER **10%**

———TOOL LIFE **50%**



—says this Superintendent

(Left) Close-up of straddle milling operation on fins for impellers of geared aircraft superchargers. Tolerance on the sides of the fins is critical as to finish and dimensions. (Right) Actual photo of a Gulf Service Engineer consulting with Superintendent on results secured with Gulf Cut-Aid on this precision machining job.

GULF CUT-AID PROVED SUPERIOR to 12 other brands of cutting oil we tested for straddle milling aluminum alloy supercharger impellers," says this Superintendent. "With this revolutionary new cutting oil, we get 10% greater production and 50% longer tool life than with the cutting fluid we used previously."

This is one of hundreds of war plants that have increased production and tool life on precision work by using the proper Gulf Cutting Oil for each particular job requirement.

Gulf performance-proven cutting oils have established records on the toughest steels and most punishing schedules that the armament and aircraft industries offer. You'll find them helpful in improving production and tool life now and in paring costs below competitive levels in the postwar period.

Let a Gulf Service Engineer show you why Gulf Cutting Oils are ideal for many of your machining jobs. Write, wire, or phone your nearest Gulf office today.

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GULF OIL CORPORATION · GULF REFINING COMPANY

Division Sales Offices:

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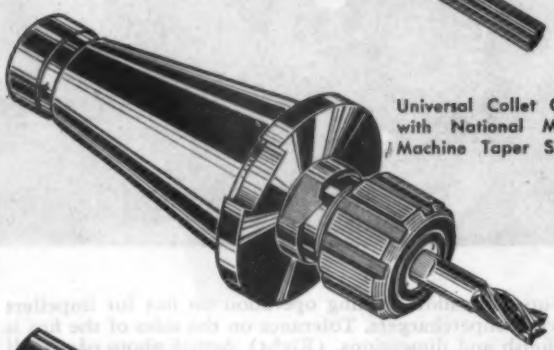
Universal Collet Chucks
Precision-built to fit the job

In addition to the four chucks shown here Universal also manufactures Boring Chucks, Mikro-lok Boring Bars, Grippets, Plungers and a complete line of standard drill bushings. Write today for catalogs on all or any one of these precision made products.

Universal Centering Chucks make a centering machine of most any medium size drill press.

Universal Floating Chucks are designed especially for horizontal operation in screw machines and turret lathes.



Universal Collet Chuck with National Milling Machine Taper Shank.

Universal Standard Collet Chucks have a grip as strong as solid steel itself — are available with tang or plain tapered shank.

20%

Fighter Plane Given by employees

20% Employees Bond deductions

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

Smooth Chatterless Operation

WITH CC Clark

ADJUSTABLE FLY CUTTER

Two models cut quick, clean, accurate holes within a 2½" to 10" range, up to 1" thick. Cross-section of cut has appearance of letter "W" with each blade taking out its own side. Unique angles at which blades are held and new grinding technique on high-speed steel cutting blades prevent chatter. Shank is heat-treated. Removable pilot, hardened and ground, permits use of lead drills.

Write for complete catalog. AM-11

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HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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Consistent Quality

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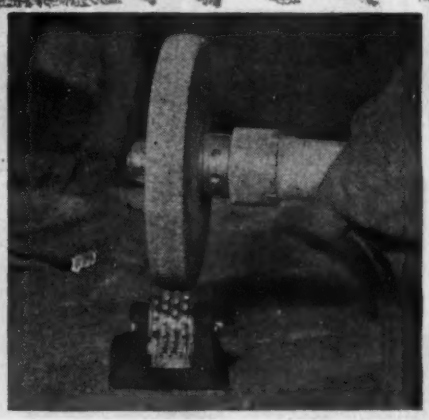
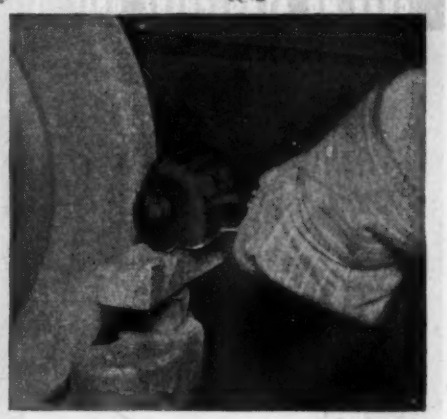
SPI-RAL

EMERY WHEEL DRESSERS

Perfect Conditioned Grinding Wheels at Much Lower Costs...

"LIKE A RARE JEWEL IN A CLASS ALL ITS OWN" CANNOT BE OUTPERFORMED





SPECIAL HOLDERS

Special applications for the SPI-RAL cutter are numerous. Pictured above is just one of the many special holders being built for special dressing operations. The above is a 54" disk wheel being dressed with one No. 410 SPI-RAL cutter. We welcome any inquiries regarding emery wheel dressing.

The D-310 SPI-RAL dresser being used to dress and recondition the emery wheel of an air operated hand grinder. The D-310 SPI-RAL dresser is fastened to the bench and the operator, with very little effort moves the running emery wheel over the SPI-RAL dresser and in a few seconds reconditions the grinding wheel.

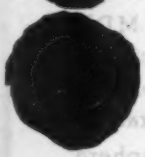
The SPI-RAL dresser is never tilted when applied against the emery wheel, but is held as shown in the picture above. A sure grip, an even pressure, held straight against the wheel, "no tilting" and a slow movement from side to side will result in a true and well dressed emery wheel, free of foreign matter, grooves and ruts.

No. 10 SPI-RAL DRESSER

For tool grinders and wheels that require a very fine finish.
No. 10 Dresser Complete.....$2.50
No. 110 Cutter Only..... .75

No. 21 SPI-RAL DRESSER

For medium or soft grain wheels where a smooth surface is desired.
No. 21 Dresser Complete.....$2.55
No. 210 Cutter Only..... .80



No. 31 SPI-RAL DRESSER

For fast dressing of coarse wheels. For foundry or any other snagging operations.
No. 31 Dresser Complete.....$2.60
No. 310 Cutter Only..... .85
Nos. 110, 210 and 310 cutters are interchangeable in the same handle.
Cutters are 1¾" diameter by 1 1/16" long.

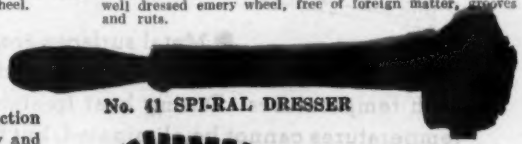
PROPER APPLICATION OF THE SPI-RAL DRESSER

The principle of design and construction of the SPI-RAL cutter is basically new and is covered by patent rights. The cutter is made in a single piece spiral, in various sizes, which, when employed in the dressing operation of an emery wheel, cuts across the face of the wheel evenly, rather than bumping off the grain. The result is a truer dressed wheel with not only an economy effected in the life of the emery wheel, but in the longer life of the dressing cutter itself.

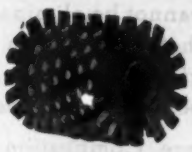
The cutter revolves on a bushing which in turn revolves on the shaft, giving it a double bearing and reducing friction to a minimum.

All moving parts are properly hardened and are provided with oiling facilities.

The hooded handle protects the operator from flying abrasives.



No. 41 SPI-RAL DRESSER



For wheels 2½" wide or wider. For foundry and coarse grinding operations. Rugged construction for heavy duty service.
No. 41 Dresser Complete $3.50
No. 410 Cutter Only..... 1.25

No. 42 SPI-RAL DRESSER

For wheels 2½" wide or wider where a smooth finish and fast cutting action is desired.
No. 42 Dresser Complete $3.50
No. 420 Cutter Only..... 1.25
Nos. 410 and 420 cutters are 1¾" by 2¼" long. Interchangeable in No. 41 handle.

No. D HOLDERS FOR DISC GRINDER

Nos. 110, 210 and 310 cutters interchangeable in No. D holder. Unless specified, No. 310 cutter is furnished.
No. D-310.....$2.85

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Gentlemen: Please send me additional information on Spiral Dressers

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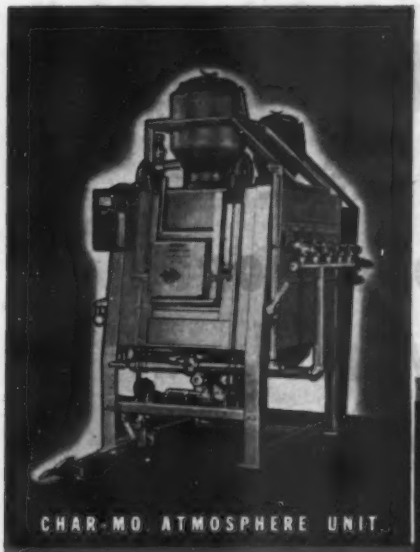
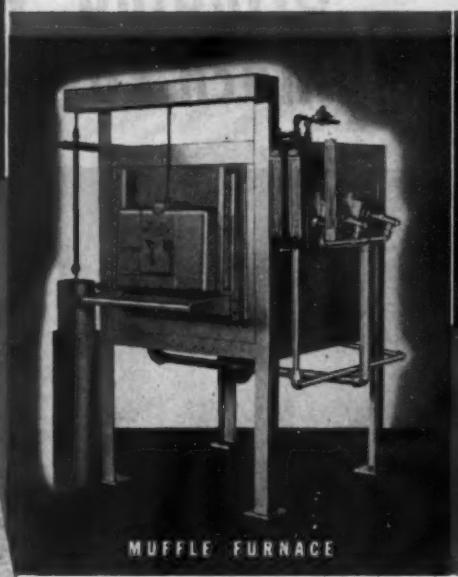
STANDARD RATED

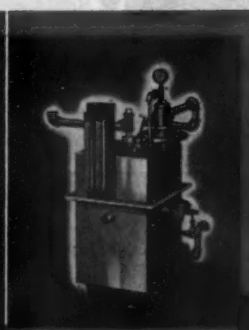
Atmosphere FURNACES



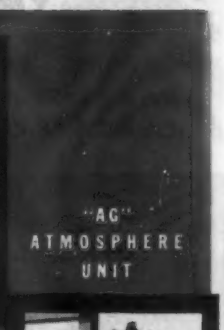
CHAR-MO ATMOSPHERE UNIT



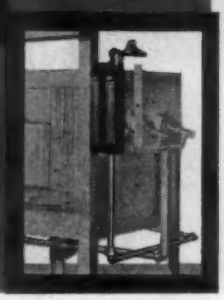
MUFFLE FURNACE

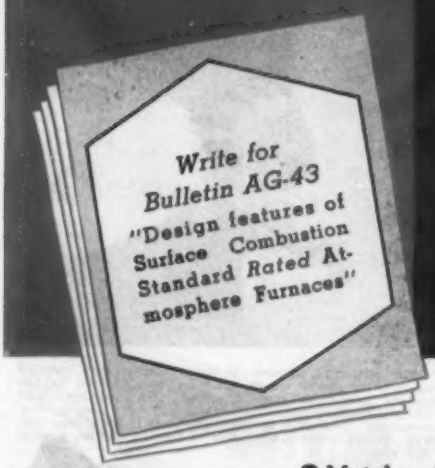


"MDX" ATMOSPHERE UNIT



"AG" ATMOSPHERE UNIT





● Metal surfaces are affected by gases and rapidly so at high temperatures. During heat treatment high temperatures cannot be eliminated, but the gases in contact with the metal can be controlled to protect the surface. Different conditions require different compositions of atmosphere gases.

From Surface Combustion Standard Rated Atmosphere Furnaces can be selected the proper furnace and the proper atmosphere to meet practically any requirement.

CHAR-MO FURNACES: Atmosphere generator is an integral part of the furnace. Char-Mo atmosphere (⅓ CO, ⅔ Nitrogen) prevents scaling and decarburization of practically all metals.

MUFFLE FURNACES: Are equipped with gas tight muffles to prevent products of combustion from contacting metal surfaces during heat treatment. Any required atmosphere can be introduced into the muffle of this type furnace.

ATMOSPHERE GENERATORS: MDX Generator provides a burned gas, water cooled atmosphere which protects low carbon steels and non ferrous metals against surface deterioration.

AG Mixers provide a cracked gas atmosphere which is protective to higher carbon steels.

The Heat Treater's Helping Hand **'Surface'**

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Standard and Special Industrial Furnace Equipment For: Forging, Normalizing, Annealing, Hardening, Drawing, Carburizing, Nitriding and Heating. Special Atmosphere Generators. *Write for Bulletins.*

Surface Hardening at Machine Gun Speed!

with

-MEGATHERM-*

INDUCTION HEATING

Here is a history-making application of a Megatherm Induction Heating Unit.

On this typical production line setup, 75 bearing pins a minute are surface hardened. This hardening is done after finish grinding has been completed.

In one high-speed operation the pins are hardened to Rockwell C 60—above file hardness—and costly finish grinding of hardened steel is avoided because scale and distortion are eliminated.

The pins are 2⅛" long and ⅛" in diameter, made of chromium molybdenum steel. To heat treat 4,500 bearing pins an hour costs approximately 50¢.

Each pin is heated above critical temperature in less than one second. Quick heating and quenching prevents scaling or distortion and gives accurate control over the hardened case depth.

This is only one of the many new applications of Megatherm Heat in the metal industry. Pieces as small as ⅛" diameter or bearing surfaces up to 6" are handled as easily, all with Megatherm.

More information on how Federal's Megatherm High Frequency Heat can save you money on your production line is yours for the asking. Check Megatherm now.

This Microphoto magnified 100 diameters shows the hardened surface developed on bearing pins. The white portion is that of the hardened outside layer which extends to a depth of 25 thousandths of an inch. At no point in the zone between the fully hardened case and the unhardened core was there any softening or tempering.

100 X

Federal Telephone and Radio Corporation

INDUSTRIAL ELECTRONICS DIVISION

An IT&T Associate

Newark 1, N. J.

*REG. U. S. PAT. OFFICE

Series "N"

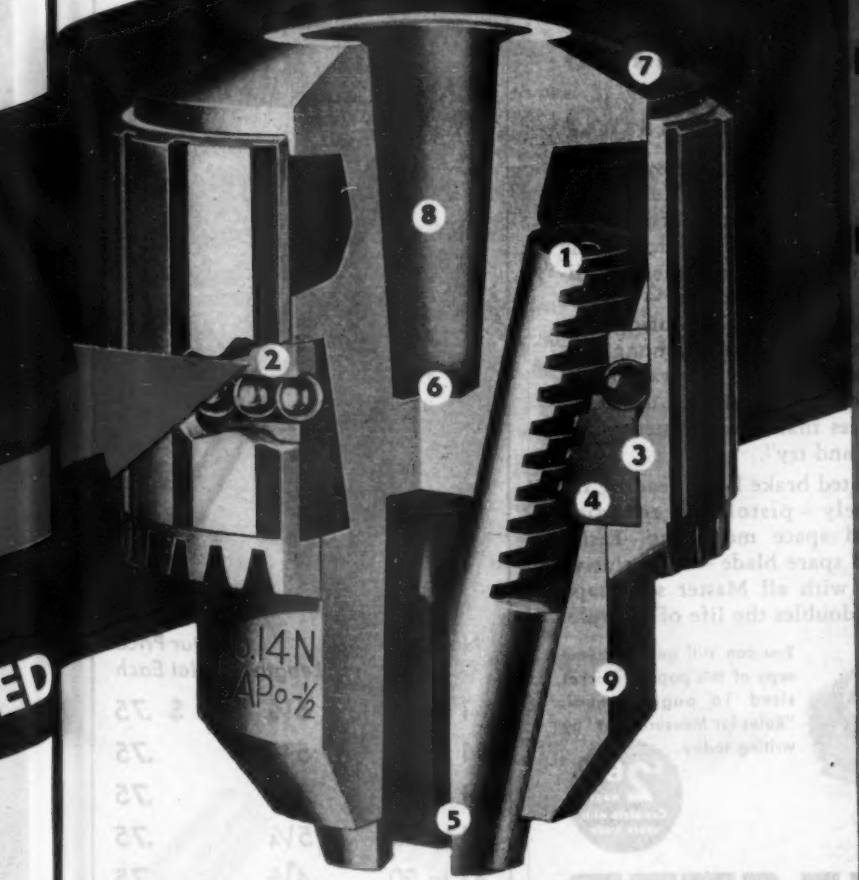
NEW AND IMPROVED JACOBS

"AN INSERTED BALL RACE HAS BEEN ADDED

A tangible "plus" has been added. The Jacobs Super Chuck has always been famous for its accuracy — gripping power — speedy operation — long life. Now that these improvements (listed at the right) have been added, the Jacobs Super Chuck is a real "plus-quality" tool, with particular emphasis on the new design which incorporates **an inserted thrust ball race (feature 2) . . . Tocco-hardening (feature 9) to eliminate warpage of jaw holes, thus improving accuracy . . . adaptability, permitting the taper hole bot-**

"THE NATIONAL STANDARD FOR Post WAR PRODUCTION"

SUPER CHUCK



Check THESE CHUCK IMPROVEMENTS:

1. New design chrome nickel alloy jaws provides 15% more thread in contact than former models. Gives corresponding increase in strength.

2. New design heat-treated alloy steel inserted thrust race with continuous deep groove, overlaps and eliminates interference with jaw holes. All working surfaces ground.

3. Ground surface on sleeve centralizes the thrust race insert and closes ball race feeding notch in the nut.

4. Heat-treated alloy steel nut with deep groove ground ball race. Gives four times the load-carrying capacity of former construction.

5. Harder jaw bites insure longer life.

6. Bottom of taper hole is soft and can be drilled out to make the chuck hollow, if this feature is desired.

7. Back of body Tocco-hardened to prevent distortion from abuse.

8. Precision bored taper hole.

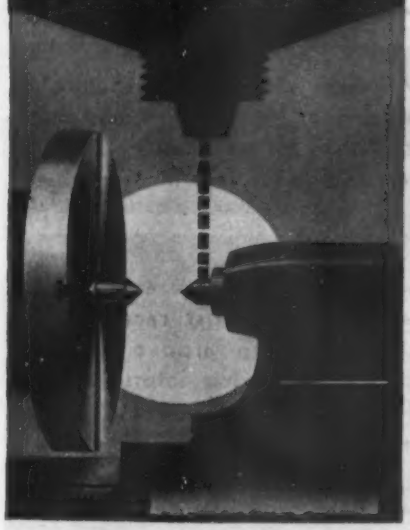
9. Nose is Tocco-hardened to resist abuse and prevent distortion of keyholes. Tocco-hardening eliminates warpage of jaw holes, improving accuracy.

tom (feature 6) to be drilled out if desired . . . increased load carrying capacity (feature 4) . . . fifteen percent more thread contact (feature 1) for corresponding additional strength.

The Jacobs "N" Series Super Chuck has already elicited enthusiastic responses from prominent users in all branches of Industry. Make sure that your heavy duty specifications include this newly improved model. Write for the new Bulletin 31-M. . . . The Jacobs Manufacturing Company, Hartford, Connecticut.

LUBRICATION

WHERE IT'S NEEDED MOST



ON THE DEAD CENTER

DIXON'S LATHE CENTER GRAPHITE LUBRICANT

controls over-heating and prevents wear at a most important point on a lathe—the dead center. It is here that friction after lubricant failure often causes scoring of the dead center and makes frequent repairs and replacements necessary.

A dead center protected with Dixon's invariably produces more accurate work. Master mechanics, and lathe hands testify to the efficiency of this unusual graphite lubricant by their fast increasing use of it. It is equally effectual for lubricating lathe steady and follower rests, and jack screws.

This non-fluid lubricant is easily applied from handy 1, 4 or 8 ounce collapsible tube. At supply houses everywhere.

Send for Loose Leaf No. 15 or see your supply house.

D

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Ticonderoga, No. 635 and Microfyne Graphite Pipe Joint Compound • Graphite Seal • Graphited Oils Cup and Pressure Gun Grease • Gear Lubricant Waterproof Graphited Grease • Auto-Marine Grease Graph-Air Guns • Belt Dressing (Contains no Graphite).

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FOR ALL TYPES OF MEASURING

Make those difficult measurements quickly, easily with the Master Streamline steel tape rule. The Streamline can be used for inside measuring, outside measuring, calipering rounds, scribing—in fact every type of bench measuring. It is an outstanding favorite among men who take pride in accurate tools. With the Streamline you avoid inaccuracies that mean wasted hours of "cut and try".

Patented brake holds reading indefinitely—pistol-butt case aids cramped space measuring. Easily inserted spare blade—an exclusive feature with all Master steel tape rules—doubles the life of the rule.

You can still get your free copy of this popular pocket sized 16 page manual, "Rules for Measurement" by writing today.

$2.65 each Complete with spare blade

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WOOD AND TAPE RULES

Master Rule Mfg. Co., Inc., Dept. P-11.
815 E. 136th St., New York 54, N. Y
Branch: 541 S. Spring St., Los Angeles, Calif.

Enclosed please find $2.65 for 6 ft. "Streamline" steel tape rule and spare blade

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IMMEDIATE DELIVERY

No. 1 to 60
New High Speed
Long Length

DRILLS

No. by Gage	*Length*	*Our Price Net Each*
1 to 10	6¼	$ .75
11 to 20	5¾	.75
21 to 30	5⅜	.75
31 to 40	5¼	.75
41 to 50	4½	.75
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If you buy 60 drills or more — 20% discount

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MACHINERY EXCHANGE INC.

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MAGIC TYPE *Quick Change* CHUCKS

FOR SPEED

. . . SAVE SET-UP TIME

● Add many stations to your machines by using Magic Quick Change Chucks.

Change tools in your Drill Presses, Turret Lathes and Boring Machines without stopping the spindles.

By simply raising the locking ring, the centrifugal force throws two balls out of position, permitting the collet to drop out automatically.

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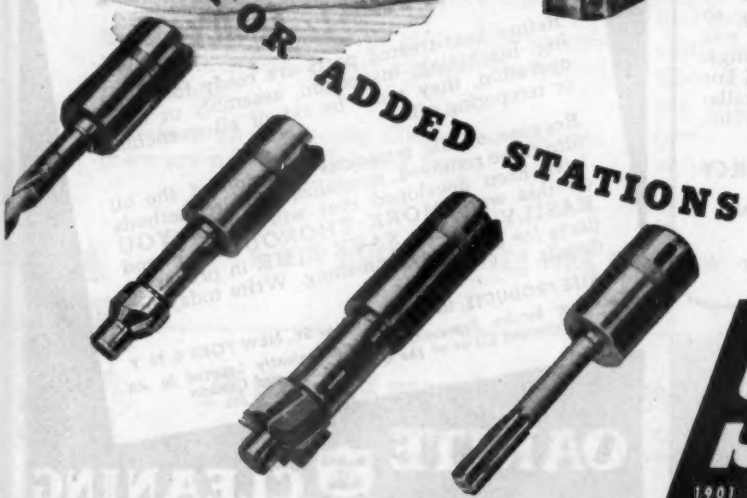

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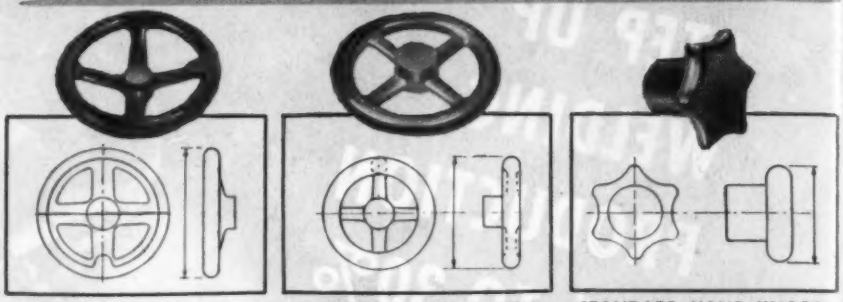

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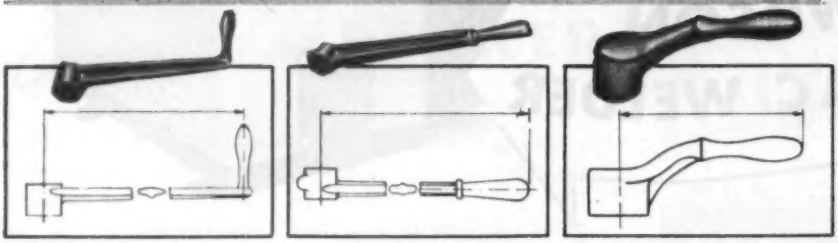

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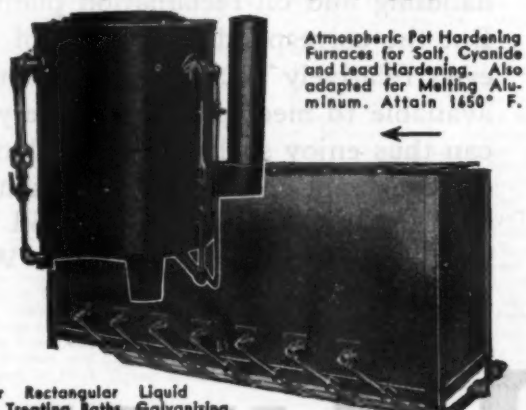

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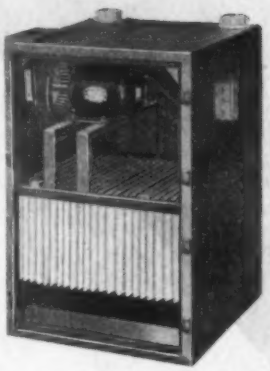

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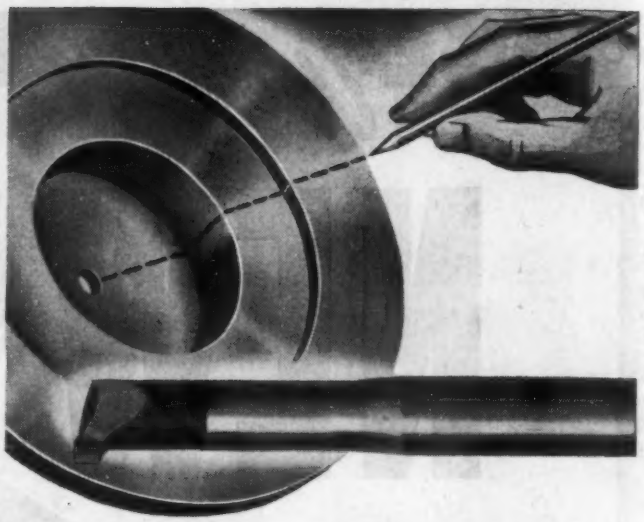

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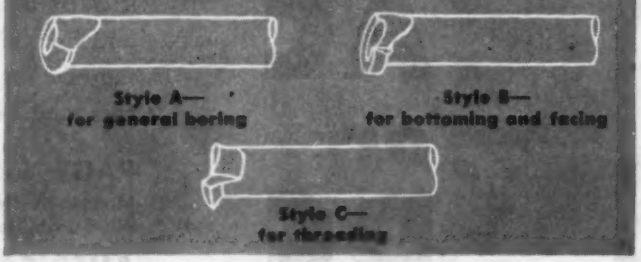

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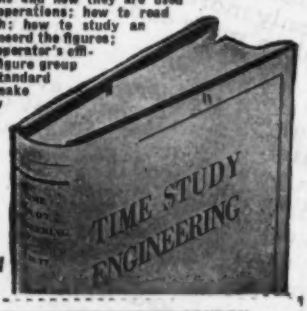

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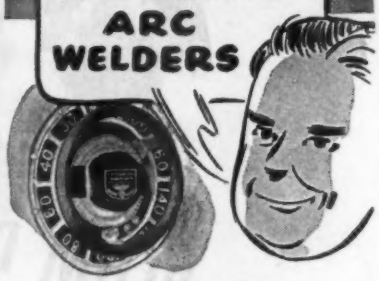

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Fig. 928

"HALLOWELL" Work-Bench of Steel with laminated wood top. Available in four different heights and in heavy or medium leg construction. Top is 24" wide by 3, 4½, 5, 6, 8, 9, 10 feet long. Planking may be 1¾ or 2½" thick. Drawer is extra. Pat'd and Pats. Pend.

"HALLOWELL" Work-Benches of Steel are so well designed and so strongly built, there's practically no wear-out to them; no high "depreciation" costs to charge on your books; no frequent replacements.

Those facts apply also to the whole "HALLOWELL" line of Steel Shop Equipment. It keeps down the annual cost of maintaining plant equipment in first class working order.

Fig. 1042

"HALLOWELL" standard weight Portable Tool Stand of steel, open shelf type with drawer. Swivel casters; with iron or rubber tires. Shelves 18" deep, 24" wide. Also furnished without casters for stationary use.

You'll find it advantageous to know all about the entire line of "HALLOWELL" Steel Shop Equipment. Write for catalogs. We shall appreciate opportunity to acquaint you with our products and your request will imply no commitment.

From the "HALLOWELL" line of Shop Equipment you can also obtain durable, well designed, practical Tool Stands; Foremen's Desks; Floor Trucks; Stools; Chairs; Shaft Hangers; Steel Collars; Clamp Style Pillow Blocks, etc.

"HALLOWELL" Floor Truck of Steel. Rolls easily under all loads. Its sturdy steel platform and welded joints defy time and abuse. Many types to choose from: there's one that will suit you.

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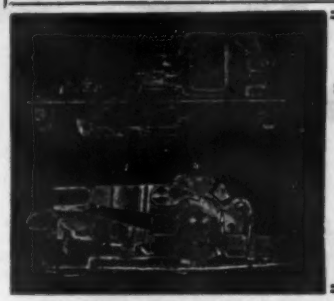

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SEARCHLIGHT SECTION

POSITIONS VACANT

MECHANICAL ENGINEER—Old established company now converted to pre-war production (Essential Products) has opening for mechanical engineer with some machine design factory layout and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of application. Address P-956, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PLANT MANAGER—New York Metropolitan district. Preferably in 30's or 40's with executive ability for established postwar plant manufacturing production products and special tool gauges and automatic machines, having 400 employees. Enclose history and photograph. P-984, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EXPERIENCED DESIGNER wanted for machine tools: Good opportunity with old established company: Give full particulars as to experience and salary desired: Application will be treated as confidential. P-988, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ELECTRIC SPOT welder experienced in welding aluminum on a sciaky machine; give complete details. Benson Manufacturing Company, 18th & Agnes Avenue, Kansas City, Missouri.

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WANTED: MECHANICAL draftsman—Machine designing and detail work on experimental and automatic machines; considerable creative ability desired. Old established business with good working conditions. Give details of qualifications and state starting salary desired. War Manpower regulations in effect. Address P-101, American Machinist, 330 W. 42nd Street, New York 18, N. Y.

WORKS MANAGER: Well established heavy industry making equipment for cutting and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Statement of availability required. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

(Continued on page 308)

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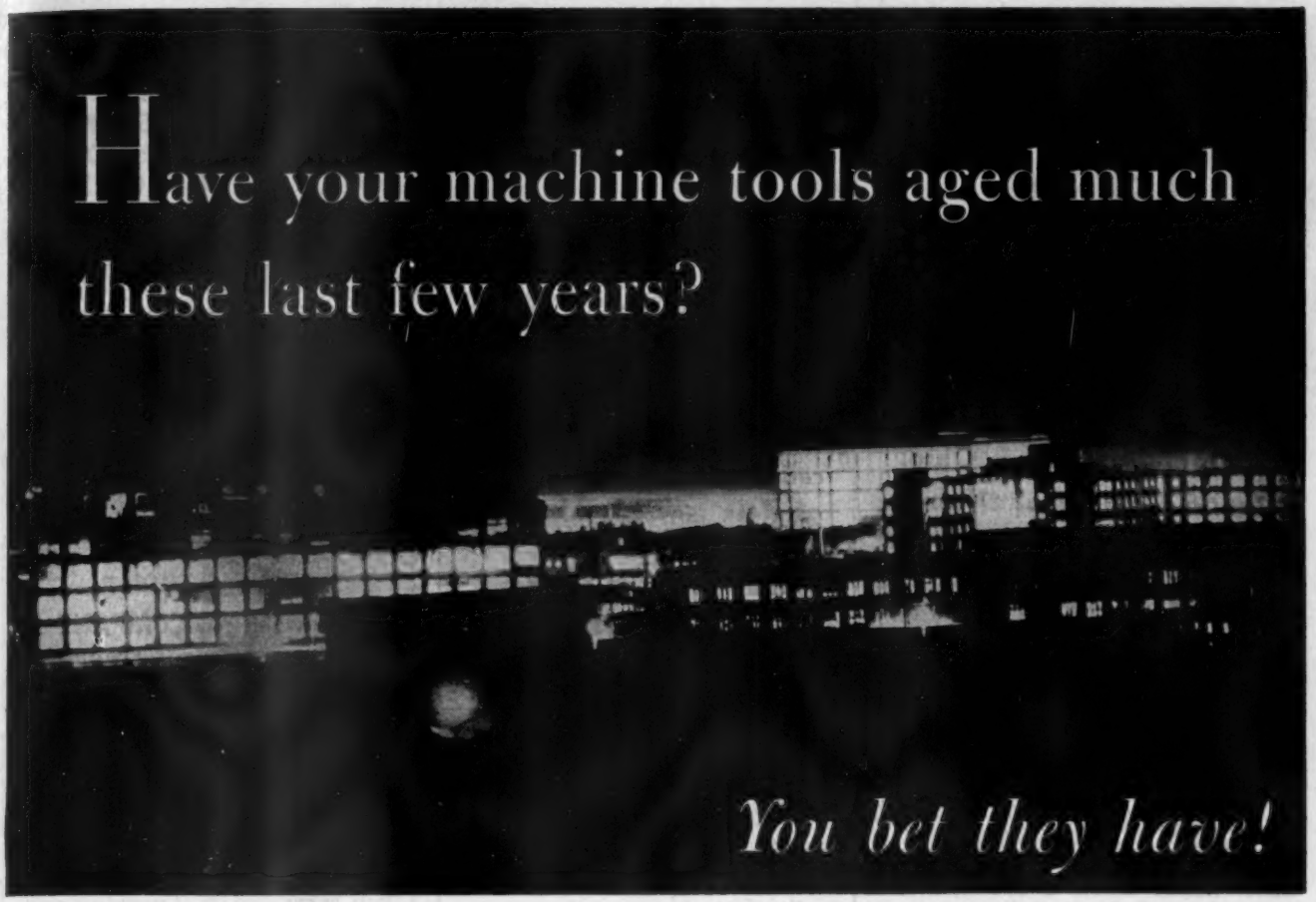
Have your machine tools aged much these last few years?



You're doing a lot of *thinking* about reconversion...*planning* to get ready for the problems ahead.

Then, why not start right on the floor of your plant? There you will find one factor you can definitely *evaluate and act on now:* your present machine tools. Operating the clock around, often in the hands of unskilled labor, they have compressed years of wear into months, without "time out" even for routine maintenance.

Isn't it logical, then, to take a "physical inventory" of the condition of your equipment and to initiate a systematic program of rebuilding, now?

Many leading manufacturers are doing just that, "furloughing" a few machines at a time and calling on the Simmons Machine Tool Corporation to see the program through.

With thirty-five years of ENGINEERED REBUILDING experience to draw upon, Simmons engineers have developed techniques that not only restore a worn tool to its maximum efficiency, but often "build-in" new utility beyond the originally designed capacity. Lengthened beds or tables, widened housings, special motors and gear transmissions and other labor saving devices, for example.

Result: More efficient and economical plant operation, a vital consideration for the competitive post-war economy.

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Excellent Post War Opportunities N. E. Ohio. Good Living Conditions W.M.C. Rules Apply

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Write New Products Department B

PEERLESS TOOL & ENGINEERING COMPANY
1133 N. KILBOURN AVENUE
CHICAGO 51, ILLINOIS

POSITIONS VACANT
(Continued from page 306)

SUPERINTENDENT: Well established heavy industry making equipment for cutting and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Statement of availability required. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

WANTED TOOL and die maker to design and instruct in manufacture of dies in Mexico, upsetting and forging die work largely. Preference to man over fifty. Permanent position. State experience, age and salary desired in reply. P-100, American Machinist, 330 W. 42nd Street, New York 18, N. Y.

ENGINEERING EXECUTIVE, capable of directing an engineering department with an established firm in the east. Should have experience on design of heavy machine tools and miscellaneous types of special machinery. The applicant should give complete particulars regarding experience and qualifications in letter. Correspondence will be kept strictly confidential. Statement of availability required. Address P-102, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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FACTORY EXECUTIVE, 46, with experience as factory manager, superintendent, chief production engineer and chief engineer on product development and design. Will consider position of major responsibility only. PW-959, American Machinist, 520 N. Michigan Ave., Chicago 11.

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for medium sized eastern manufacturer, presently engaged in war work. Must have experience in tooling problems and economical and smooth organization of production. Postwar products being engineered, assuring continuous, pleasant and remunerative position.

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Excellent condition!

5' American Plain Radial Drill
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ALL MOTOR DRIVEN
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Additional Auction Ad on Page 314

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LATHES

14"x6' Hendey, Taper
48"x12' Harrington Gap Sid. Bed
McCabe 26-42"x14'
32"x25' New Haven, raising blocks to 60"
20"x14' Rahn-Larmon, raised to 24", M.D.
24"x10' Lodge & Shipley Grd. Hd. Taper, M.D.
16"x8' Lodge & Shipley Grd. Hd. Taper, M.D.
14"x6' Mulliner, taper
14"x6' Sebastian Grd. Hd.
9" LeBlond Automatics
Wickes 32"x26', M.D.
LeBlond 36"x21' M.D.
Putnam 36"x30', M.D.

AUTOMATICS

New Britain 1⅝", 6 spindle
Cleveland Model A, ½", ⅝", ¼", 2"
Cleveland Model B, 1", 2"
Gridley 4¼", sgle. spdle.
B. & S. Nos. 00, OG, 2
P. & J. No. 6A, M.D.

GEAR CUTTERS

No. 3, 12 Barber-Colman Gear Hobber
No. 6 Fellows Gear Shapers
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel

MILLING MACHINES

No. 20 Van Norman
10" P. & W. Automatic
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. Rpd. traverse, M.D.
Nos. OY, 1Y, 3, 4, 5, B. & S. Plain & Univ.
B. & S. No. 12, 13, 13B
Hall Planetary Model D
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12 Profiler, dbl. spindle
30" Pratt & Whitney Profiler
No. 2 Kent-Owens
No. 4, B. & S. Universal

RADIALS

5' Dreses, Full Universal
8' Amer. Triple Purpose
3', 3½' Cinc-Bickford
4' Mueller, M.D.
4', 5' Western, S.P.D.

MISCELLANEOUS

600 ton Birdsboro Hydraulic Press
6 spindle Avey Drill, 15" overhang
800 ton Coining Press, McCabe ½" Flanger
Rochester 5B Hammer
Pels 6' Throat punch
P. & W. 6" Vert. shaper
Marvel Metal Band Saw, M.D.
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
150 ton United Forging Press
Thompson-Gibbs Spot Welders 17 KVA
Anderson Tapper, No. 23A Quickwork Rotary Shear
6x80" P. & W. Thread Miller
⅝"x5' Plate Levelling Roll
4x4x⅝" W. & W. Angle Bending Roll

AARON MACHINERY CO.
MONA
45 Crosby St.
New York 12, N. Y.

"FALK" for DEPENDABILITY in Rebuilt Machinery

OUR INVESTMENT IS YOUR SECURITY

"FALK" STOCK—A modern stock, with every item owned by "FALK" and in our warehouse or enroute. Shipments can be scheduled because "FALK" owns the machines. "FALK" critical inspection is given to every stock item.—Your inspection is welcome under ideal conditions for selecting machine tools.

"FALK" FACILITIES—Modern facilities to operate, rebuild and inspect used machine tools are provided to assure successful operation. Experienced personnel under supervisors with years of experience in our organization.

GOOD BUYS FOR THE MODERN SHOP* — IMMEDIATE DELIVERY

SHEARS

L & A 10' x 3/16".
#672 Niagara, 72" x 10 ga.
Lennox Splitting Shear, 8' throat, ¾" cap., arr. M.
Lennox Bevel Shear, ¾" cap., arr. M.D.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss D.C. B.G. Forging 4" stroke (2).
#4½ Bliss 3 column B.G. 3" stroke.
#5 Bliss D.C. B.G. Forging 3" stroke:
#74½ Bliss S.S. geared, 2" stroke.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Vertical, 48" Gisholt.
Hill 4" Bar Horiontal Table Type.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".

DRILLING MACHINES

Weigel 22" B.G., Sl. Hd., tapping, P.F.
Superior 26" B.G., Sl. Hd., tapping, P.F.
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Leland Gifford 2 spindle.
Woodward & Rogers 6 spindle.

RADIAL DRILLS

4' Arm 11" Col. Cincinnati Bickford
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
7' Arm 13" Col. Cincinnati Bickford

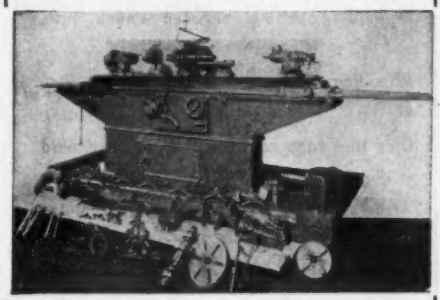
MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Fox #D-31 24 spindle motor drive.
Natco #D-5 8 spindle #1 M.T.

GRINDERS

16" Heald Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
12" Heald Rotary Surface Grinder equip. with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump.
Oliver Model 51 Drill Grinder; 1½" cap.
Pratt & Whitney 14x36 model B vertical surface grinder.

Brown & Sharpe No. 4 Univ. Cylindrical Grinder. M.D., with regular equipment.



Capacity:—Centers swing 12" dia.; over water guards 10¾". Distance between centers 60". Takes wheels to 12" dia. x ½" to 1" thick. Longitudinal Table travel—10 changes in rate; range 1½" to 53" per minute. Work speed—6 changes for live or dead center grinding. B & S No. 9 taper hole.

MILLING MACHINES

#4 & #5 Cinn., High Power, Plain, S.P.D.
No. 3 Cincinnati, High Power, Vertical
No. 2 Brown & Sharpe, Vertical, S.P.D.
No. 0 Bickett Vertical Bench Miller
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2).
#1 Kempsmith Universal, Cone Drive.
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"36" N.-B.-P., Planer Shaper, M.D.

LATHES

South Bend 16" x 6' Motorized Gap Lathe.
Putnam 26 x 12 Heavy QCG, arr. for M.D.
American, 16 x 6 Q.C.G., Geared Head
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
LeBlond 14 x 6 Q.C.G.
Seneca Falls Tool Room 14 x 6, Q.C.G.

SHAPERS AND GEAR CUTTERS

24" American, M.D.
16" Queen City, M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared, Belt Dr.
#61-2 Fellows 36" Gear Shapers (2).
12" Schuchart & Schutte Gear Hobber.

BENDING ROLLS

Bertsch 3" x 3" x ⅜" angle bending roll.
Niagara pinch type 7' x 7" roll motor driven.

MISCELLANEOUS

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room, all sizes.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face, 20" diameter.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72" cap. 14 ga. arranged M.D.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

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MACHINERY

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FALK

MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER 5, N.Y.

Ready For Shipment

AUTOMATICS:
Cosmatics—1½" Cap.
B & S #00, #0 & #2
Cleveland 2¼" A—M.D.
Gridley 2¼" 1 sp.
Gridley 1¼"—Model G, late model
New Britain #23, 33 Chuckers
Potter & Johnston #6C Chuckers
Geer & Deleeuw Chucker

BORING MILLS:
Cleveland 2½" Bar Horiz.
Universal 3½" Bar Horiz.
Bullard 36" Rapid Production
Bertram 42" Vertical

DRILLS:
Niles 7' Radial
Cincinnati-Bickford 6' Radial
Pratt & Whitney Gun Barrel Drills & Rifflers

GEAR CUTTERS
Brown & Sharpe #3—26"
Fellows #64
Fellows Gear Burnisher
Gleason 6" Generator
Gleason 3"—1940 machine
Gleason 8" mfg.
Detroit Gear Grinders
Lees Bradner #2HS, 12" Gear Grinders

GRINDERS:
Bryant #24 Chucking
Norton 6x32, 10x24, 18x96
Baxter D. Whitney #23 Cylinder Grinder. Like New
Brown & Sharpe #11 Plain
Heald #70-A Internal
Say-way Internal
Brown & Sharpe #3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Landis 20"x120", 20"x144" Plain Grinders
Cincinnati #1½ Tool & Cutter
Norton #2 Tool & Cutter
Pfauter Hob Grinder
Bryant #3B, 6, 12, 18 Internal
P & W 14" B.B. Vert. Surface
Farrel Roll Grinder
Norton & Cincinnati Tool & Cutter
Badger #8 Disc Grinder, M.D.

LATHES:
Fay 14" Auto.
Monarch & LeBlond 14"x6'
Bidney 17"x8'
Bedford 20"x12', T.A.
Johnson 36"x24'
McCabe 33"x35"x10½'—Two in One
J & L 2½x24, 3x36 Flat Turret

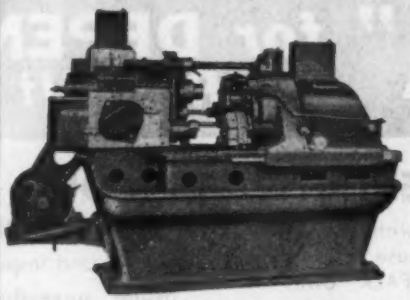
MILLERS:
Brown & Sharpe #000 Plain, new 1942
Brown & Sharpe #10 Plain, new 1942
Brown & Sharpe #0Y Plain
Sundstrand #8 Rigidmill—New 1942
Cincinnati #2 Plain SPD
Milwaukee #1½B Vertical
Becker #4B Vertical
Cincinnati #3, #4 Vertical SPD
B&S #3 Vertical SPD
Hanson-Whitney Thread Miller
Waltham Beach Thread Miller
Rowbottom Cam Miller
P & W 8", 12" Automatic
Pratt & Whitney 2" Spline Duplex
Pratt & Whitney 4½"x12", 6"x14", 6"x80" Thread Millers
Cincinnati 12" B.G. Mfg. Becker #7H Lincoln Hall Planetary

MISCELLANEOUS:
Boring Machine—Carter Diamond Borer
Chambering Machine—Pratt & Whitney
Chucking Machines—Potter & Johnson #8-C
Hammer—Bliss 300 Lb. Drop
Header—W-F ¾" Ball
Header—W-F #1—6SSD
Honing Machine—Garline Model MCV New
Jig Borer—Cloerman #1830
Shear—Marshalltown #86 Rotary Bevel, M.D.
Tapper—Threadnut #2
Upsetter—Acme 2" Steel

PLANERS:
American 26"x26"x8' — Cincinnati 48"x48"x20' 3 Head
Cincinnati 36"x36"x20' — Gray 84"x72"x18' 4 Head

PRESSES:
Ferracute #D66F 50 Double Geared 185 ton cap. 30" Stroke, Weight 36,000 lbs., New 1939
W-F 20 Ton Rack & Pinion

BOTWINIK BROTHERS, INC.
373 Welton St. New Haven 9, Conn.



8½" X 8" GOSS & DELEEUW CHUCKING MACHINE

Capacity 8½" in diameter x 8" long 5 chucks on turret

Maximum opening between chuck jaws 9⅝"

Minimum opening between chuck jaws 7⅝"

Maximum distance spindle nose to face of turret 23¾"

Dies and taps controlled by positive lead screw

Arranged for Motor Drive, without motor Weight approximately 12,000 lbs.

(Available for Prompt Delivery)

Emerman Machinery Corporation
875 W. 120th St., Chicago 43, Ill.

MISCELLANEOUS MACHINES

1—36"x36"x12' Cinci. Dbl. Housing Planer 2 rail hds., 1 side hd., D.C. m.d.
1—36" widened to 48"x36"x16' Gray Dbl. Housing Spur Grd. Planer with 3 hds., 3-speed A.C. m.d.
1—56"x56"x18" Cinci. Dbl. Housing Planer with 3 hds. D.C. vari. speed m.d.
1—6' Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.
1—12"x18" Cinci. Rebuilt Plunge Cut Grinder, 18"x9" face wheel, A.C. m.d.

STRONG, CARLISLE & HAMMOND CO.
1302 West 3rd St. Cleveland 13, Ohio
Branch Offices:
2832 E. Grand Blvd. Detroit 11, Mich.

PLATE SHEAR

48"x1" capacity Cleveland Plate Shear, arranged for motor drive and equipped with A.C. motor and control. Has 24" gap. 18 strokes per minute. Type P.S.

THE EASTERN MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI 24, OHIO

Bending Roll, 10' x ¾" Bertsch Initial Type
Draw Block, Double, 22", M.D.
Grinder, 10" Bridgeport, Knife
Keyseater, #2 Baker, 2" x 18?
Miller, Universal, #3 Cincinnati, M.D.
Miller Vertical, #3 B. & S., S.P.D.
Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
Shaper, 20"-24"-32".
Shaper, 36" Morton, Draw Cut.

West Penn Machinery Company
1319 House Bldg. Pittsburgh, Pa.

No. 5 Cincinnati Plain Mill, S.P.D.
Norton 10"x36" Grinder, M.D.
Gridley, Model H, 4 spindle Chuckers

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laureiton Road, Rochester 9, N.Y.

GEAR MACHINERY

9" Pratt & Whitney Gear Grinder, M.D. 1937
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
Cimatool Gear Chamfering Mach., M.D.
Lees-Bradner Gear Grinder

PLANERS

26"x26"x6' Woodward-Powell Planer 2 Hds.

MILLERS

2H Kearney & Trecker Vert. (2)—1941
U.S. Multi-Millers (4) 1941
No. 25-B Defiance Hor. Bor. Mill 3¼" bar, New 1941
No. 10 Brown & Sharpe—1941
No. 1—12" and 1—18" Cincinnati Plain Automatic millers latest type (8) 1941
No. 2 Cincinnati Vertical Miller, Dial Type 1941
New No. 3 Wigglesworth
4" Taylor & Fenn Duplex Spline 1941

GRINDERS

No. 72-A—3—Heald Plain 1940
No. 72-A—3—Heald Sizematic 1940
10"x72" Model C Norton 1941
12"x120" Landis Pl. M.D.
No. 10 B & S Plain Grinder, M.D.

LATHES—TURRET LATHES

22"x72" Lodge & Shipley 1941
24"x72" LeBlond Lathe 1941
16" Model C Monarch Keller (1941)
No. 1A Warner & Swasey (2) 1941
6"x8¾" Goss & DeLeeuw Chucking Machine
No. 6R Cincinnati Acme 1941
24" Bullard Vert. Turret, Hi-Speed 1940

MISCELLANEOUS

No. 60 1" New Britain (6)—1941
1½" Consmatic 4 spindle 1940
No. 0-Ajax Forming Roll 1941
No. 21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Sprue Cutter
New Delta Drilling Equipment
No. 4 Hvy. Duty Colburn Drill

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge 41, Mass.

OPENSIDE PLANER
48" x 48" x 19'

Detrick & Harvey, 3 Heads
LOW PRICE FOR QUICK SALE
THE O'BRIEN MACHINERY CO.
113 N. 3rd ST. PHILA. 6, PA.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. New York City

Machinery for Sale

Steam hammers 1000#, 800#, 580#, Bignall-Keeler 8" pipe threader, Cochran-Bly #2 circular saw and saw sharpener; back geared #3 and #4 Morse taper drill presses. Pratt & Whitney, #3 die sinker. Williams & White #2 Bulldozer, Ajax Forging Rolls.

WANTED

4" upsetter, 150-300 ton trimming press

Merchandise for Sale

Surplus shackles from ¼" to 2¼", boom chain 1", Liverpool and Seattle cargo hooks, 18" x 1¾" pipe turnbuckles, 18" diam. ¾" pipes 19' and 31' lengths.

Vince Forging & Manufacturing Co., Inc.
EASTON, PA.

POWER PRESSES

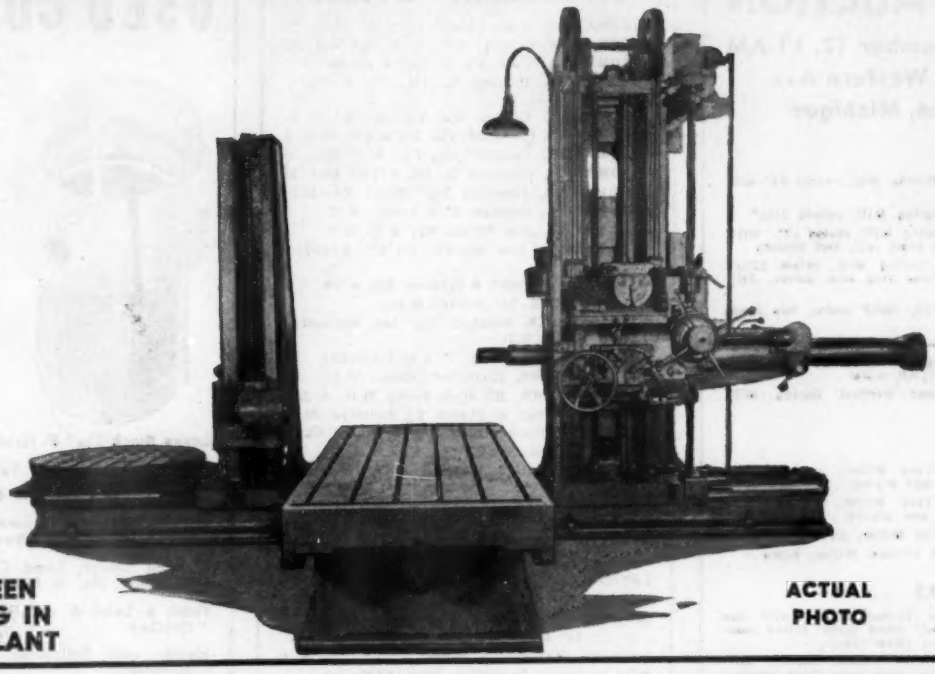
BLISS, TOLEDO, V & O, ETC.
REBUILT - GUARANTEED

MONA MEMBER

JOSEPH **HYMAN** & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

SEARCHLIGHT SECTION

PRODUCE FOR WAR—PREPARE FOR POSTWAR



CAN BE SEEN OPERATING IN PRIVATE PLANT

ACTUAL PHOTO

5" OHIO SPINDLE HORIZONTAL BORING MILL. Table Type, 48x140" Table, 4' Rotary Table; A. C. Motor Drive. Vert. travel of head on columns 5 ft.; motor driven oil pump and piping.

MILLING MACHINES

HORIZONTAL BORING MILLS:
8" NILES BEMENT POND, M.D.
7" BARRETT CYLINDER BORING BAR, Floor Type
5½" NILES, Table Type, Table 23"x78", B.G.
5" NO. 229 DETRICK & HARVEY, Floor Type, No. 6 M.T., Outboard Sup., M.D.
4" KEMPSMITH, Floor, 42x60" table, M.D.
3¾" BARRETT, Floor Type No. 6 M.T., M.D.
3½" BEAMAN & SMITH, Table type, 24x48" table.
3" PUTNAM, No. 5 M.T., P.F.
FOOTE-BURT 2-Way Drilling & Boring

VERTICAL BORING MILLS:
2—72" COLBURNS, Geared Feeds, Rapid traverse, 4 Chuck Jaws, 2 sw. heads on rail
51" BULLARD, 2 swivel hds. on rail, B.G., 50" table.
48" ROCKFORD, 3 sp., 48" rotary table.
4—Spindle ROCKFORD, 38" table.

PLAIN:
NO. 5-B BROWN & SHARPE, M.D.
NO. 4 LEBLOND, Heavy Duty.
NO. 4 CINC., 16½x64" table, M.D.
NEWTON KEYWAY MILLER, P.F.
NO. O ROCKFORD, P.F.

PLANER TYPE & SLAB:
42"x42"x13' INGERSOLL SLAB.
42"x36"x6' B&S OPENSIDE PLANER TYPE.

6" BULLARD, 4 Stations, M.D. Serial num. over 14,000. Exc. condition

THREAD:
6x72" & 6x48" Pratt & Whitneys
No. 3 Lees Bradner

VERTICAL:
No. 3 B & S., 14½"x49" table, P.F., M.D.
No. 2 B. & S., B.G. 10¼"x38½" table.
No. 2½ B Kearney & Trecker 14"x70" table.

PRODUCTION:
OHIO Type P, M.D. 16x72" table. New '41.
24" Cinc. Plain Auto. 9¼x35½" table, P.F.
No. 45 Productomatic, Rotary table.
3—18" Cincinnati Automatics.
10" P. & W. Semi-Auto., 6½x18" table.

LATHES

FLOOR:
50"x18' FITCHBURG, D. B. G., M.D.
36"x17' AMERICAN, Geared Head, Q.C.G.
30"x12' LEBLOND, Q.C.G., 2½" hole.
16"x6' PRATT & WHITNEY, Geared hd.
14"x6' BRADFORD; 14"x4' L & S.
8" SUNDSTRAND STUB LATHE
30' PIT LATHE, face plate 156"
PIT LATHE, 86" swing over ways

NEW 14"x6' ROBBINS GEARED HD. TOOL ROOM LATHE, M.D. Taper Att., Motor in base M.D., NO PRIORITY — IMMEDIATE DELIVERY.

TURRET:
28" N.B.P., 4¼" hole, P.F., M.D.
26" LIBBY, Grd. Hd., 7½" hole, P.F., M.D.
2—21" GISHOLTS, 5" & 3¼" hole, M.D.
No. 16 GISHOLT SIMPLI, 21 & 23" swing.
NO. 6 B & S., 2 1/16" hole, B.G., M.D.
JONES & LAMSON GRD. HEAD, A.C. M.D. 2¼x24", Bar Feed; 2¼x24" Chuckers (2).
18" LIBBY, Grd. Hd. 3 5/16" hole, M.D.
No. 2 & 3 FOSTERS; No. 2 & 3 WOODS; No. 2 B & O.

NO. 1-A WARNER & SWASEY, 2½" cap. Power feed, Rapid Traverse, M.D.

SCREW MACHINES

PRACT. NEW 1½" FOOTE BURT SGLE. SPINDLE. Hydr. Feed Auto., Max. cap. 1⅝", M.D.
NO. 2 B & S TURRET FORMERS (2) 1⅛" hole.
2½" GRIDLEY SGLE. SP. AUTO., M.D.
NO. 55 NATIONAL ACME; NO. 652 NEW BRITAIN AUTO. CHUCKER
NOS. 2 & 3 MANVILLE WOOD SCREW

DRILLS

FLOOR:
24" BARNES, Camel Back.
8-sp. MULTIPLE, M.D., #4 M.T.
6-sp. LELAND GIFFORD. 4-sp. BARR, No. 1 M.T.

RADIAL
7 FT. AMERICAN TRIPLE PURPOSE, 17" col., No. 6 M.T.
6 FT. AMERICAN UNIVERSAL, Box Table, Grd. M.D. thru gear box.
6 FT. AMERICAN, Box table, M.D.
4 FT. FOSDICK, 12" col., M.D.
4 FT. AMERICAN, No. 4 M.T., 11" col.
3 FT. FOSDICK, No. 4 M.T., 10" col.
3 FT AMERICAN, Motor on arm.

GRINDERS

32"x10'6" FARRELL ROLL GRINDER will grind rolls up to max. 34" dia. and 10' between centers, 30" wheel. With A.C. Motors.

INTERNAL:
NO. 72 HEALD SIZEMATIC, Hydr. Feed. NO. 60 HEALD. NO. 52 GREENFIELD HYDROILS.

CYLINDER:
10x72" LANDIS, Self-cont.
NO. 55 STORM, 8x15" cap.
12"x34" & 10"x36" LANDIS.
3" LANDIS RACE.

SURFACE: 15"x15"x8' NORTON, M.D.
UNIVERSAL: BATH, 11" swing, P.F.

PLANERS

36' SELLERS PLATE PLANER, 34 pneumatic holddowns, M.D.

DOUBLE HOUSING:
60"x60"x18' POND, 2 hds on rail.
60"x44"x12' GRAY, 4 hds, M.D.
44"x36"x12' GRAY, 2 hds on rail.
36"x32"x12' GORTON DBLE HD.

OPENSIDE:
44"x38"x14' NEW ALBANY.
42"x40"x14' PATCH.
42"x42"x14' PATCH.
42"x36"x14' NEW ALBANY.
42"x45"x15' LINCOLN.
42"x44"x15' BEDFORD.

MONA MEMBER

SLOTTERS & SHAPERS

24" BETTS RAPID TRAVERSE SLOTTER.
14" NEWTON, 30" table, A.C. M.D.
BETTS SLOTTER, 9" Stroke.
72" MORTON DRAWCUT SHAPER, 18' travel.
24" CINC., Sgle Pulley Drive.
16" G & E SHAPER, M.D.

INTERSTATE Machinery Co., Inc.

1439 W. PERSHING RD., CHICAGO 9, ILL.

PUBLIC AUCTION

Tuesday, December 12, 11 AM
at 659 W. Western Ave.
Muskegon, Michigan

BORING MILLS

42" Colburn Vertical Boring Mill, raised 24" with two motors

44" Baush Vertical Boring Mill, raised 21½"

51" Baush Vertical Boring Mill, raised 15", 10HP motor, two heads on cross rail, tool holders

42" Bullard Vertical Boring Mill, raises 22½", 15HP motor, 20" three step cone pulley, 5HP motor

51" Bullard Boring Mill, 10HP motor, two heads on cross rail

42" Niles Bement Pond Boring Mill, raised 24"

44" Niles Bement Pond Vertical Boring Mill, 13½" rise block, 7½HP motor

53" Niles Bement Pond Vertical Boring Mill, raised 18½"

MILLERS

#15 Garvin Planer Type Miller, vertical, with 10HP motor, pump and piping

#15 Garvin Planer Type Miller, vertical, with 10HP motor, pump and piping

Model C Becker Vertical Miller, pump

#5B Becker Brainard Vertical Miller, pump

THREAD MILLERS

12"x36" Lees Bradner Thread Miller, with two 3HP motors, Ingersoll Rand motor driven coolant pump and piping (New 1941)

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#25 Foot-Burt Single Spindle Drill, magnetic control, push button station, table and cross travel

#4 Baush Vertical Multi-Drill four spindles with two turret station fixtures, 25HP motor, magnetic control, push button station, coolant pump and piping

LATHE

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#4 La Pointe 68" Broach

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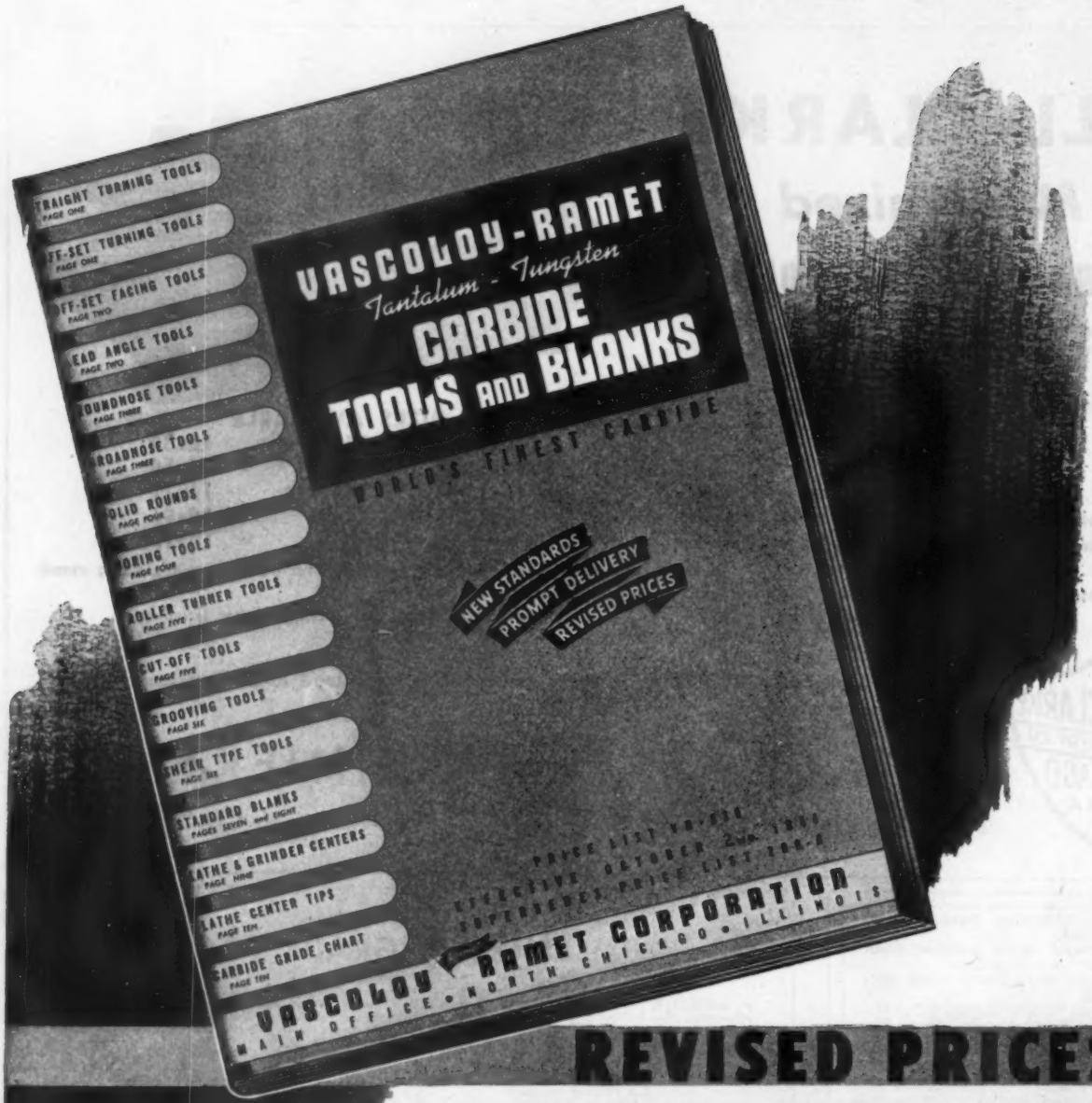

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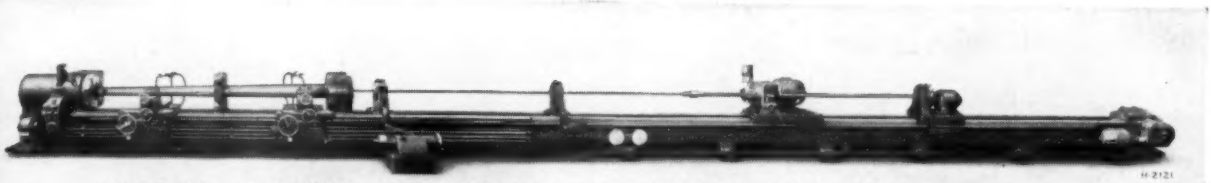
Such a remark coming from an "old timer" merits but one reply—a skeptical "Oh, Yeah!" A man in his dotage never feels as good as he did in the prime of youth. Neither can he do the things he used to do. True, he still manages to get around, but down deep in his heart the "old timer" knows that old age has caught up with him.

And so it is with those old machine tools in your plant, particularly the lathes. Just check their scrap percentages, their speed of production, accuracy, the time out for readjustment and repairs. Yes, they're turning, but not at a real profit. Old lathes, old machine tools are man-hour wasters, costly "slow down" artists. As far as profitable operation is concerned, they're through. They must be replaced by new and better machines.

It will pay you to investigate the merits of the New LeBlond Lathes. They'll help you meet tomorrow's greater, keener competition with confidence. LeBlond is building tomorrow's lathes today. Write for catalog.



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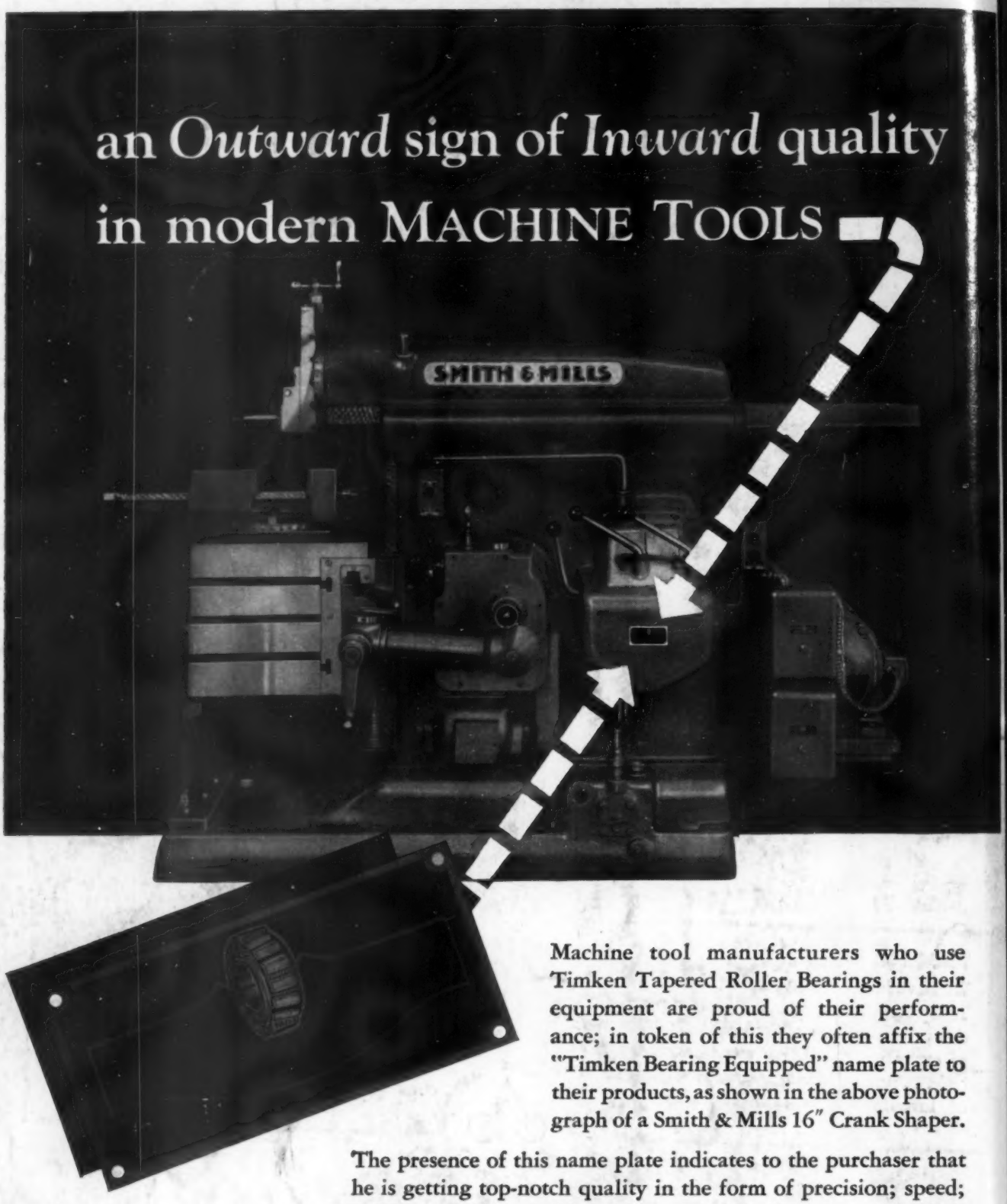

Machine tool manufacturers who use Timken Tapered Roller Bearings in their equipment are proud of their performance; in token of this they often affix the "Timken Bearing Equipped" name plate to their products, as shown in the above photograph of a Smith & Mills 16″ Crank Shaper.

The presence of this name plate indicates to the purchaser that he is getting top-notch quality in the form of precision; speed; endurance; long machine life; and low maintenance—through the ability of Timken Bearings to eliminate friction and wear, to carry radial, thrust and combined loads and to hold moving parts in proper and permanent alignment.

Timken Bearings are used throughout the transmission of the Smith & Mills 16″ Crank Shaper; the manufacturer knows it pays — and so do the users of these shapers. The Timken Roller Bearing Company, Canton 6, Ohio.

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